

**City of Seattle
Municipal Stormwater NPDES Permit**

2001 Annual Report

Providing an update on the status of stormwater program activities conducted during 2001 with updates, as appropriate, for 2002.

Submitted pursuant to Special Condition S10 of the National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for discharges from municipal separate sewers for the Cedar/Green Water Quality Management Area.

Municipal Stormwater NPDES Permit No. WASM 23003



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August 30, 2002

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2001 Stormwater Management Program Update Report

1. INTRODUCTION

This report is submitted by the City of Seattle pursuant to Special Condition S10 of the National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for discharges from municipal separate storm sewers for the Cedar/Green Water Quality Management Area. The report covers the 12-month period between January 1, 2001, and December 31, 2001, with updates as appropriate through mid-2002.

Seattle received its NPDES Municipal Discharge Permit from Washington State Department of Ecology (Ecology) in 1995. In 1997, Seattle's Stormwater Management Program (SWMP) was approved by Ecology as meeting the requirements of that permit. Owing to the number of changes in the way we address stormwater issues over the years, the format of this report has been changed significantly from earlier reports in order to provide an overview of ongoing stormwater programs, many of which have been initiated since the 1995 permit was issued. Note that this report is not intended to amend the City's SWMP or to commit the City to future actions in addition to the required SWMP. Details of additional program elements are provided to Ecology for informational purposes only.

This report is divided into four sections.

1. Background: Stormwater and the City of Seattle. This section contains an overview of the Nature of urban stormwater runoff and the challenges facing fully built environments like Seattle. It also provides an overview of the organizational responsibilities of key departments in the City involved in stormwater management and water quality.
2. Seattle's Stormwater Management Program Components. In this section, the various elements of Seattle's stormwater programs are summarized. Accomplishments during the reporting period are included and, for readers desiring additional information, a point of contact is provided for each program element.
3. Other Permit Reporting Requirements. The City's NPDES Municipal Stormwater Discharge Permit contains mandatory reporting elements that do not properly fit under one of the program headings in the previous section. These mandatory reporting elements are included in this section. Examples include as fiscal analysis and changes in permit coverage area.
4. Next Steps. This section reflects on the challenges of stormwater management in the City of Seattle.

Two appendices are included at the end of this report:

- Appendix A provides a listing of current stormwater management programs and staff points of contact
- Appendix B cross-references the reporting requirements contained in the 1995 NPDES Municipal Stormwater Permit with the appropriate sections contained in this report

Comments or questions regarding the overall organization or content of the report can be directed to Robert D. Chandler, Ph.D., Seattle Public Utilities Resource Planning Division, at 206-684-7597 or robert.chandler@ci.seattle.wa.us

2. BACKGROUND: CITY OF SEATTLE AND STORMWATER

2.1 STORMWATER AND THE URBAN ENVIRONMENT

Urban stormwater runoff is the water that runs off surfaces such as rooftops, paved streets, highways, and parking lots. Runoff can also come from graveled areas and hard grassy surfaces like lawns and play fields. Urban stormwater runoff is a problem for several reasons.

Flooding: In less urban areas, much of the rainfall is intercepted by trees and vegetation or infiltrated into the soil. In urban areas like Seattle, most of the rainfall remains on the surface where it can collect in low lying areas and cause flooding.

Human Health: In general, untreated stormwater is unsafe. It contains toxic metals, organic compounds, and bacterial and viral pathogens. Untreated stormwater is not safe for to drink and can lead to closures of swimming areas.

Aquatic Environment: In urban areas, our creeks, streams, and rivers can be harmed by urban stormwater. Because so little of the rainfall is intercepted or infiltrated, high volumes of runoff arrive in these water bodies causing erosion and sedimentation. Stormwater can also adversely affect water quality by carrying the pollution from roadways, lawns, and business activities.

In Seattle, as it collects on roadways, lawns, gutters, and other impervious surfaces, stormwater begins to flows through a variety of systems. These include:

Natural Drainage System: Swales, ravines, and stream corridors such as Thornton Creek or Longfellow Creek are all examples of natural drainage systems. Natural drainage systems cross privately and publicly owned property.

Ditch and Culvert System: This kind of system involves a combination of surface ditches and culvert usually located in the public right-of-way that convey stormwater to a natural drainage system or a public storm drain.

Public Storm Drain: This public drainage system is wholly or partially piped and is designed to carry only stormwater. Public storm drains convey stormwater to a natural drainage system or directly to receiving waters such as Lake Union or Lake Washington.

Public Combined Sewer: Seattle's Combined Sewer System conveys both stormwater and wastewater a system of pipes to King County's treatment facility at West Point. The treated water is released into Puget Sound.

To meet the challenges or urban runoff, urban areas like Seattle must implement comprehensive stormwater management programs. These programs include capital projects to address both flooding and water quality concerns, maintenance activities to keep these facilities functioning properly, a range of programs designed to influence the actions of everyone who works or lives in the watershed. Many of these programs, primarily those related to the *quality* of the stormwater (as opposed to the *quantity* of stormwater) are described in this report.

2.2 SEATTLE DEPARTMENTS INVOLVED IN STORMWATER MANAGEMENT

Among the many department serving Seattle, the four described below are most involved in programs and projects relating to stormwater management and receiving water impacts.

Seattle Public Utilities

Seattle Public Utilities (SPU) was formed in 1997 during a municipal reorganization that placed the four rate-support utility services of solid waste, drinking water, wastewater and drainage into one City department. Prior to the reorganization, Seattle Engineering Department's Drainage and Wastewater Utility (DWU) performed drainage planning. Today, SPU is the designated lead department for managing stormwater, including meeting regulatory requirements, conducting water quality programs, and managing drainage-related capital projects.

Department of Design, Construction & Land Use

The Department of Design, Construction and Land Use (DCLU) is the City department responsible for developing, administering, and enforcing development standards. It is DCLU that issues development permits as required under Seattle's Stormwater, Grading and Drainage Control Code (Seattle Municipal Code 22.800 – 22.808) and inspects sites prior to and during construction.

Seattle Department of Transportation

Seattle Department of Transportation (SDOT) is responsible for the City's streets and bridges, bike paths, street trees, traffic operations. SDOT performs such roadway maintenance activities as street sweeping and snow and ice control, and is currently responsible for issuing permits for side sewers to connect to the City's mainline system. The Capital Projects Division of SDOT oversees all aspects of Transportation CIPs and coordinates development and implementation of large-scale city projects.

Office of Sustainability and the Environment

The Office of Sustainability & Environment (OSE) was created in the fall of 2000 to help put sustainability into practice, both within City government and in the community at-large. While OSE's primary focus is on "municipal sustainability" (more sustainable City operations, facilities, and services), this office also seeks to promote and increase "community sustainability" (more sustainable practices by businesses, other institutions, and individual households and citizens). One of OSE's mission is to provide leadership, tools, and information to help City government and other organizations use natural resources efficiently, prevent pollution, and improve the economic, environmental, and social well-being of current and future generations. Among the more recent endeavors has been a citywide effort to reduce pesticide use.

Seattle Parks and Recreation

Responsible for several hundred parks and park facilities, Seattle's Department of Parks and Recreation (SPR) is a key player in environmental stewardship. During 2001, SPR trained their staff in comprehensive Best Management Practices for various maintenance activities, reduced pesticide use, worked to remove invasive plants and replant native species, and continued its partnership with Seattle Public Utilities on creek improvement projects. Highlights of SPR's accomplishments during 2001 can be found in their annual report, which is available at <http://www.cityofseattle.net/parks/Publications/annualreport.htm>.

3. STORMWATER MANAGEMENT PROGRAM COMPONENTS

In this report, Seattle's stormwater- and water quality-related programs are organized into

twelve functional categories as shown in Figure 1. The categories are:

Comprehensive Stormwater Planning: Includes planning processes underway used to further develop and enhance Seattle's stormwater management programs.

Partnerships: Activities aimed at coordinating stormwater-related policies, programs, and projects among jurisdictions within a watershed, and among Seattle's departments sharing similar responsibilities.

Regulations and Technical Standards: These regulations are designed to control runoff from new development, redevelopment, and construction activities. Regulations also address source control and pollution prevention at existing commercial and residential areas.

Permitting, Inspections, and Enforcement: Programs that ensure proper application of and compliance with adopted regulations and standards.

Pollution Prevention: These programs are aimed at reducing or eliminating pollution before it can be picked up by stormwater runoff and conveyed to receiving waters.

Illicit Discharge Reduction: An illicit discharge occurs when something other than stormwater is allowed to enter one of our conveyance systems. Two programs are listed under this category that reduce such discharges – Hazardous spill response and illegal dumping.

Public Involvement, Education and Stewardship: In this category are the variety of programs whose purpose is to provide opportunities for individuals and groups to become involved in environmental and water quality activities, and learn how to be better stewards of our natural resources.

Operations and Maintenance – Drainage System: These programs help Seattle maintain its public drainage infrastructure.

Operations and Maintenance – Roadways: In this category are described the programs operated by SDOT to reduce stormwater impacts from public streets.

Municipal Training: Training occurs throughout many of the programs within other programmatic categories. Under this category is listed a new training program specifically aimed at improving drainage system maintenance.

Information & Data Collection, Analysis & Management: This category includes many of the programs that collect and compile information needed to evaluate performance of programmatic activities and to assess the effectiveness of policies, standards, programs, and projects over time.

Capital Improvement Program: This category includes primarily SPU –sponsored capital projects involving facilities or other improvements that address stormwater impacts.

Additional details on these programs are provided in this report.

**City of Seattle
Stormwater Management Programs**

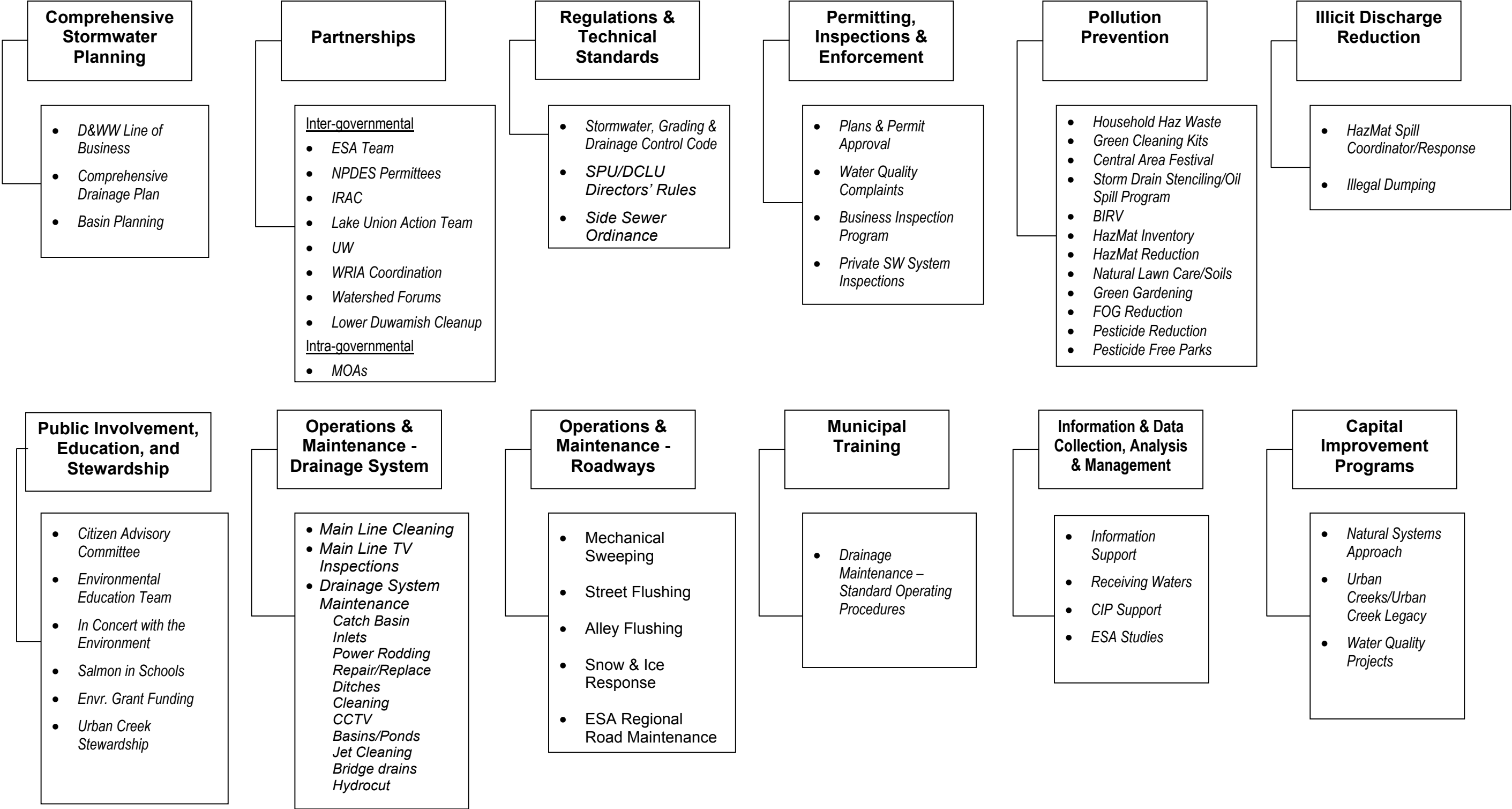


Figure 1. City of Seattle Stormwater Management Programs

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3.1 COMPREHENSIVE STORMWATER PLANNING

SPU, as the lead stormwater management department for the City of Seattle, is involved in a number of planning endeavors designed to improve delivery of services and enhance environmental quality. Highlights of major planning efforts are provided below.

3.1.1 Drainage and Wastewater Line of Business

In 2001, SPU formed the Drainage & Wastewater Line of Business Team and charged it with integrating programs and services across all SPU branches and divisions. To begin meeting this goal, the D&WW LOB conducted an assessment of drainage programs, services and core businesses. This assessment, completed in June 2002:

- Identifies key challenges following an analysis of the current state of service delivery;
- Defines core service areas;
- Aligns efforts with the Mayor's and SPU Director's focus on assets, operations, and customer service; and,
- Develops goals and identifies strategic directions to move toward over the next five years.

The D&WW LOB Assessment laid the groundwork for a follow-on Strategic Plan which will further develop and define core business areas. The plan will also set forth goals specific to each core service area and provide strategic directions necessary over the next five years to move the utility from its current state to the desired future state.

Denise Andrews (206) 684-4601

3.1.2 Comprehensive Drainage Plan Update

In early 2002, SPU began a two-year project to update its 1995 Comprehensive Drainage Plan (CDP). When complete, the new CDP will chart a 20-year course for SPU's Drainage Programs, prioritizing key action items, and addressing how best to meet the city's goals for surface water management. The CDP will include:

- A vision for surface water management that includes Seattle creeks, shoreline, and lakes as well as traditional drainage infrastructure;
- A fully developed Natural System Program that optimizes water quality and quantity management and mobility goals in the right-of-way;
- A framework to integrate city-wide drainage needs and services;
- A resolution of key issues related to surface water management; and
- A robust 6-year drainage CIP with recommendations for operational and enforcement programs that meet stormwater NPDES permit requirements.

The CDP will also define basic drainage services to be provided to the Seattle ratepayers, including:

- Public safety as it relates to drainage;

- Protection and, where feasible, enhancement of water quality and habitat for key aquatic resources;
- Response to regulatory requirements; and
- Management of public investment of the drainage infrastructure.

These services will be applied in a manner that reflects geographic differences within the city and the corresponding service needs. Links with other City Departments and the services they provide will be created in order to optimize benefits to ratepayer.

The CDP will also address long-standing policy and planning needs, including:

- The need to more effectively coordinate and prioritize drainage services on a citywide basis to optimize ratepayer's dollar. This includes the identification and coordination of capital projects within the Drainage Program;
- The need to balance capital projects, field maintenance, and other programmatic efforts (e.g., education) to meet surface water management goals;
- The need to define clear policies related to the work we do.

Darla Inglis (206) 233-7160

3.1.3 Basin Planning

Norfolk Drainage Basin

The Norfolk Basin Drainage Study is being developed to provide an organized and systematic implementation plan for future improvements in the 800-acre South Norfolk drainage basin. The Drainage Study evaluates the existing drainage system, identifies existing problem areas, develops improvement alternatives, and recommends a phased capital improvement plan. The Drainage Study and modeling were completed in May 2002 and the Study has recommended a capital project phasing plan for drainage improvements over the next 20 years. The water quality component to the Norfolk Drainage Plan is currently in progress.

Richard Smith (206) 684-5012

South Park Drainage Basin

South Park Drainage Study (Phase 2) project will provide an analysis and report of alternatives to address flooding problems in the South Park basin. The objectives of the project are:

- Prepare a comprehensive surface water drainage plan for South Park in Southwest Seattle;
- Coordinate that plan with other adopted neighborhood plan objectives;
- Support Seattle Public Utilities (SPU) in setting drainage policies and selecting future capital improvements specific to this drainage basin;
- Propose projects to provide a formal drainage system; and

- Recommend a specific project to reduce flooding adjacent to the Duwamish River between 2nd Ave S and 7th Ave S.

The Draft report was completed in July 2002 and is currently under review by SPU staff. SPU met with the South Park Business Association Board of Directors in June 2002 and there will be meetings in the future to review initial results of the project. A drainage study *Modeling Manual* is also being developed. This drainage study is being coordinated with the 2002 Comprehensive Drainage Plan effort.

Sahba Mohandessi (206) 684-7592

Densmore Drainage Basin

The Densmore Drainage Study includes analyzing the storm drainage system in the Densmore Basin to its discharge into Green Lake. This system is referred to as the Densmore Drain North. Densmore Drain South consists of Green Lake, and King County's drain south of the Densmore diversion structure including the Densmore Pump Station, force main and gravity outlet to Lake Union. The study will provide an analysis and report of alternatives to address flooding problems in the Densmore Basin and assess the water level impacts on Green Lake. An associated, but separate, study will be completed which addresses the water quality aspects of the alternatives needed to solve flooding problems in the Densmore Basin. This study does not include addressing flooding problems around Green Lake or I-5, or basins that contribute to the pump station. A Draft Modeling manual of Hydrologic/Hydraulic Model developed for the basin is currently under review by SPU staff. The findings of the draft report are to be presented to the City and County staff before the final study is completed. The final report will also be presented to other stakeholders, Broadview, Bitter Lake, Haller Lake Neighborhoods, Licton Springs Association and Bitter Lake Urban Village. This study is being coordinated with the 2002 Comprehensive Drainage Plan. A future water quality component to the Densmore Drainage Plan has been funded.

Sahba Mohandessi (206) 684-7592

Thornton Creek – Basinwide Flow Control Plan

The principal objectives of the Thornton Creek Basinwide Flow Control Plan are to identify options to control flooding and improve fish and wildlife habitat. The detailed analysis of Thornton Creek hydrologic conditions began in 1998 with a limited reconnaissance and initial stream gauging at selected locations. Flow data collected during the period of study were then used to calibrate hydrologic and hydraulic models. Three separate models were selected to simulate runoff response of the Thornton Creek basin and flow routing through principal conveyance systems. The three models were: the Expert Stormwater management Model (XP-SWMM), the Hydrologic Simulation program – FORTRAN (HSPF), and the Hydraulic engineering Center – River Analysis System (HEC- RAS). The calibrated models were used to establish existing conditions and predict problem areas. Potential solutions were then developed to address the identified problems. A Draft Report was completed in April 2001 documenting the hydraulic analysis and alternatives evaluation performed for the drainage basin.

Neil Thibert (206) 684-7589

3.1.4 Public Participation in Planning Processes

(See 3.7.1, Citizen Advisory Committee)

3.2 PARTNERSHIPS

Managing stormwater, reducing pollution, and improving the conditions of our receiving waters involves the combined efforts of many Seattle's departments as well as partnerships with other jurisdictions. Most of these collaborative efforts are described elsewhere in this report.

3.2.1 Intergovernmental Coordination

Below are some selected examples of how the City of Seattle is involved in partnerships with other jurisdictions sharing responsibilities within our watersheds.

ESA Team

In May 1999, the National Marine Fisheries Service (NMFS) listed the Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) as *threatened* under the Endangered Species Act (ESA) and in December 1999 the US Fish and Wildlife Service (USFWS) added the coastal bull trout (*Salvelinus confluentus*) to the threatened list. In response, an interdepartmental, citywide ESA Team was formed. The ESA team focuses on four primary issues: (1) negotiations with National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS), (2) regional coordination with Shared Strategy and Tri-County, (3) supporting regional watershed action planning, and (4) developing salmon research and habitat investments designed to protect and restore Seattle's major aquatic environments. This Team reports to the Directors of SPU, City Light, SDOT, Parks, Design/Construction and Land Use, and to the Mayor's Office. Seattle's urban environment represents highly impacted habitats, requiring an adaptive management strategy to determine the best and most scientifically valuable actions to take. The city has continued to encapsulate scientific knowledge in such reports as the *Major Factors Influencing Chinook Populations* (2000) and the *Urban Blueprint for Habitat Protection and Restoration* (2001). In June 2001, the City of Seattle completed the *Urban Blueprint for Habitat Protection and Restoration* (available at <http://www.ci.seattle.wa.us/salmon/blueprintdoc.htm>). (See also Section 3.11.4, page 40.)

Martin Baker (206) 684-5984

NPDES Municipal Stormwater Permittee Interagency Working Group

The City of Seattle is a regular participant in the NPDES Municipal Stormwater Permittee Interagency Working Group, whose members represent all the NPDES stormwater-permitted jurisdictions in the State of Washington, as well as the Washington State Department of Ecology. The Working Group meets periodically to discuss and coordinate stormwater management programs and NPDES municipal stormwater permit issues. In addition to Ecology and Seattle, other member agencies include City of Tacoma, King County, Snohomish County, Pierce County, Clark County, Washington State Department of Transportation (WSDOT), Ports of Seattle, and Port of Tacoma.

Robert Chandler (206) 684-7597

Interagency Regulatory Analysis Committee

Seattle Public Utilities regularly participates in the Interagency Regulatory Analysis Committee (IRAC). IRAC began in mid-1993 as a forum for state and local regulatory agencies to share their diverse regulatory perspectives. IRAC's mission is to create a more effective and efficient means of protecting the environment, public health and safety through coordination of regulatory agencies. A primary goal of IRAC is to collaborate with other institutions to address gaps, overlap and inconsistencies relating to regulatory issues. One representative of SPU is

presently serving on the IRAC Advisory Committee. SPU is also actively involved in three IRAC workgroups: Water Quality and Fire Retardant, Water Quality and Restaurant Grease, and Troublesome Sites.

Ryeann-Marie Woods (206) 386-4024

Lake Union Action Team

The Lake Union Action Team (LUAT), which was formed in 1988 as part of Ecology's Urban Bay Action Program, was chaired by SPU until September 2001. The goals of the Urban Bay Action Program include protecting ecosystems from further degradation, restoring damaged areas, and protecting the beneficial uses of the water body. The Lake Union Action Team is a multi-agency body that supports the goals of the Urban Bay Action Program by coordinating regulatory and source control efforts in the Lake Union drainage basins. Local, state and federal regulators involved with the Lake Union watershed meet on a bimonthly basis. In addition to SPU, members of the Lake Union Action Team include representatives from Seattle Parks and Recreation, Seattle Department of Design, Construction and Land Use, King County Industrial Waste Program, King County Hazardous Waste Program, King County Wastewater Treatment Division, Port of Seattle, Washington State Department of Ecology, Washington State Department of Natural Resources, Washington State Department of Fish and Wildlife, Washington State Department of Transportation, US Environmental Protection Agency, and the US Army Corps of Engineers.

Robert Chandler (206) 684-7597

University of Washington Center for Urban Watershed Management

SPU serves on the advisory panel for the Center for Urban Water Resources Management at the University of Washington, which is one of the region's best resources for research and education in stormwater management-related topics. The Center is funded in part by support received from the Stormwater Technology Consortium, of which the City of Seattle is a member. Other members of the Consortium currently include: King, Snohomish, Spokane, Pierce, and Kitsap counties, and the cities of Bellevue, Olympia, Kent, and Everett.

Robert Chandler (206) 684-7597

Local Hazardous Waste Management Program

Seattle is an active participant in the Local Hazardous Waste Management Program (LHWMP) in King County, an interagency partnership that includes SPU, the Water and Land Resources and Solid Waste divisions of King County's Department of Natural Resources, the Public Health Department of Seattle and King County, and the Suburban Cities Association.

Kathy Minsch (206) 615-1441

Watershed Resource Inventory Area (WRIA) Coordination

The City of Seattle continues to be actively involved in Watershed Resource Inventory Area (WRIA) planning. The jurisdiction of the city of Seattle is contained in WRIA 8 (Cedar/Lake Washington) and WRIA 9 (Green/Duwamish). Owing to municipal operations in other areas outside the city's limits, Seattle is also active in WRIA 7 (Tolt/Snohomish), WRIs 3 & 4 (Upper & Lower Skagit), and WRIA 62 (Pend Orielle). SPU has two full-time, senior-level WRIA coordinators (WRIA 8 & 9), and Seattle City Light has allocated staff to WRIs 3, 4, 7 and 62. WRIA planning efforts work to build inter-jurisdictional coalitions and to integrate citywide efforts

within each WRIA. The WRIA planning bodies have focused planning agendas on developing baseline salmon habitat assessments and recovery plans, which have included identifying watershed-wide informational needs and limiting factors to salmon recovery. In February 2002, WRIA 8 produced a Draft Near-Term Action Agenda for Salmon Habitat Conservation and in May 2002 WRIA 9 issued its final Near-Term Action Agenda for Salmon Habitat Conservation. These documents are the product of over a year of collaborative discussions among elected officials, jurisdictional staff, business and environmental groups, scientists, and concerned citizens. They are intended to provide guidance to local governments and interested organizations and citizens on interim measures that can be undertaken in the near-term while longer-term conservation plans are being developed. Additional information for WRIAs 8 and 9 can be found at <http://dnr.metrokc.gov/WRIAS>.

Keith Kurko, WRIA 8 (206) 233-1516; Judith Noble, WRIA 9 (206) 684-8078

Scott Powell, WRIA 7 (206) 386-4582; Ed Connor, WRIAs 3&4 (206) 615-1128; Al Solonsky, WRIA 62 (206) 386-4580.

Watershed Forums

The Seattle's elected officials and staff have participated in local Watershed Forums since their inception several years ago. These Forums were initially formed an outgrowth of the Regional Needs Assessment for surface water management, and were originally tasked to address surface water management needs, including flooding and water quality. The Forums were later expanded to also address salmon and related habitat issues and in 2001 they were formally aligned with the WRIA planning processes. The purpose of these Forums is to:

- Provide an opportunity for all local governments that share the watershed to discuss salmon habitat and water quality issues;
- Provide overall direction for joint efforts to recover salmon habitat;
- Allocate King Conservation District funds to salmon habitat projects and activities important to the entire WRIA; and
- Provide oversight for the jointly funded staff working on salmon habitat planning.

The boundaries of Seattle lie within the Lake Washington/Cedar/Sammamish Forum (WRIA 8) and the Green/Duwamish and Central Puget Sound Watershed Forum (WRIA 9). [Note that in 2001, the Central Puget Sound Subforum was incorporated into the Green/Duwamish Forum.] Interlocal agreements have been signed through which all jurisdictions are financially supporting the WRIA planning process. King Conservation District funds, allocated through the Forums, support projects for salmon recovery, in some cases supplying the local match for Salmon Recover Funding (SRF) Board grants.

Keith Kurko, WRIA 8 (206) 233-1516; Judith Noble, WRIA 9 (206) 684-8078.

Lower Duwamish River Sediment Cleanup and Restoration

The City is preparing a Remedial Investigation of the Lower Duwamish in partnership with King County, the Port of Seattle, and Boeing. This is being done under an Agreement on Consent (AOC) with EPA and Ecology under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) and the Model Toxics Control Act (MTCA). SPU is also a member of the multi-jurisdictional Elliott Bay/Duwamish Restoration Panel (EBDRP), which was created as a result of a consent order settling Natural Resource

Damages claims. EBDP includes representatives from NOAA, US Fish and Wildlife, the Muckleshoot and Suquamish tribes, the Department of Ecology, King County and the City of Seattle. It prioritizes and funds clean-up and restoration projects on the Duwamish River using City and County funds contributed as part of the settlement. It has funded a clean-up project at the Norfolk site, removing 5500 cubic yards of contaminated sediment for disposal. Habitat projects include habitat restoration at the Seaboard Lumber site and other locations.

In 2001, SPU inspected nearly 270 businesses in the Norfolk and Diagonal drainage basins to identify possible pollutant sources and to ensure that businesses were in compliance with the City stormwater, grading, and drainage control code (SMC 22.800). SPU is currently working with King County to coordinate source control efforts in the upland areas served by public drainage and sewer systems.

Martha Burke (206) 684-7686

3.2.2 Intra-governmental Coordination

Specific under this category of Intra-governmental coordination is the successful completion of two Memoranda of Agreement involving SPU, Seattle Department of Parks and Recreation, and Seattle Department of Transportation.

Memoranda of Agreement

In 2001, Seattle Public Utilities negotiated a Memorandum of Agree (MOA) with Seattle Department of Transportation (SDOT) and an MOA with Seattle Department Parks and Recreation (SPR). These two MOAs formally recognize roles and responsibilities related to project funding and program coordination. To oversee implementation of these MOAs, participating departments formed Joint Executive Teams, or JETs, which provide a forum for resolving conflicts and incorporating lessons learned into future joint efforts. The SPU/SDOT MOA provides for up to 4% of the Drainage and Wastewater Fund to be allocated toward SDOT CIP projects that trigger stormwater flow control or treatment requirements. The SPU/SPR MOA was used during 2001 to better coordinate urban creek projects that occurred on Parks property, including Longfellow Creek/West Seattle Golf Course, Taylor Creek/Lakeridge Park, and Pipers Creek/Carkeek Park.

Terry Kakida (206) 615-0507

3.3 REGULATIONS & TECHNICAL STANDARDS

3.3.1 Stormwater, Grading and Drainage Control Code and Directors' Rules

In July 2000, the City revised its Stormwater, Grading and Drainage Control Code (Seattle Municipal Code 22.800 - 22.808) and associated Directors' Rules for Flow Control, Stormwater Treatment, Source Control, and Construction Stormwater Management. Now fully in effect, the Code and Directors' Rules can be viewed on the City's Website:

<http://www.ci.seattle.wa.us/dclu/Codes/sgdccode.htm>

Beginning in early 2002, Seattle Public Utilities, working in partnership with Seattle Department of Transportation (SDOT) and the Department of Design, Construction and Land Use (DCLU), began identifying where changes in the City's 2000 Stormwater Code may be warranted in light of Ecology's newly issued Stormwater Management Manual for Western Washington (August 2001). The long-term goal of this project is to develop a revised set of technical standards and

code requirements for stormwater flow control, treatment, construction and source control that account for Seattle's built environment and development patterns while, at the same time, taking advantage of Ecology's revised guidelines. This project is being conducted in conjunction with development of SPU's Comprehensive Drainage Plan.

Robert Chandler 206-684-7597

3.3.2 Side Sewer Code

Seattle Municipal Code 21.16, the Side Sewer Code, prohibits certain discharges into the City's public sewer system, drain, ditch, or natural outlet. Included in the list of prohibited discharges are: fats, oils, grease, high temperature liquids, flammables and oils, toxic and poisonous substances, garbage, sand, and mud.

Robert Chandler 206-684-7597

3.4 PERMITTING, INSPECTIONS & ENFORCEMENT

3.4.1 Drainage Plans and Permit Approval

Development permits are issued by Seattle's Department of Design, Construction and Land Use (DCLU). The Site Development Desk of DCLU is staffed by Drainage Review Specialists who provide technical advice on grading and drainage components of construction projects. In 1999 DCLU conducted an internal reorganization, combining the teams that conducted drainage and Environmentally Critical Area plan review with the teams that conducted on-site inspections. This single group is called the *Site Development Services* (SDS) team. The intent is to bring all the necessary skills associated with Grading and Drainage into one team to perform a comprehensive Plan review and Inspection. The SDS team currently consists of a supervisor, two drainage reviewers, four senior site inspectors, three geo-technical engineers, a Senior Civil Engineer and a wetland biologist. Special concerns of the Site Development Services team are construction in Environmentally Critical Areas (ECA), shorelines, and the drainage basins of the five major creeks of Seattle. In 2000, DCLU initiated a new program that required pre-application site inspections for all construction projects where the existing ground condition or vegetation will be disturbed. These pre-application site visits are generally done within 48 hours of DCLU receiving a complete application. The site visit is designed to verify actual on-site conditions, including topography, soils, environmental impacts, specific concerns, and the types of BMPs needed. The SDS team is expanding its services by incorporating the Side Sewer function by end of 2002. This will consolidate the drainage review and inspection function as relates to development under one agency and help to improve control of soil erosions as a result of utility work. It is also anticipated to develop a comprehensive permit tracking system to effectively evaluate the impervious surface additions as a result of construction.

Kaveh Aminian (206) 233-7858

3.4.2 Water Quality Complaints

SPU water quality field investigators respond to water quality-related complaints within the City limits. The complaints can originate from citizens who call the City's hotline (684-7587), staff reports and referrals from other departments and agencies. When the team responds to a complaint, attempt is made to determine the responsible party and stop the polluting action. Inspectors also provide technical assistance on applicable best management practices, clean up and disposal options and education on relevant code information. If practical, the responsible

party is required to clean up the polluting material. When necessary, the field crew requests that City maintenance crews sweep the street, clean catch basins, or perform other operations. All complainants, if accessible, are notified of investigation results.

SPU water quality investigators received 292 surface water quality complaints in 2001 and 159 between January 1 and June 30, 2002. Staff conducted on-site investigations at 252 sites in 2001 and 130 sites as of June 30, 2002. A summary of the water quality complaints received during 2001 and the first 6 months of 2002 are provided in Table 1.

Table 1. Summary of Water Quality Complaints

Type of Action	January 1 to December 31, 2001	January 1 to June 30, 2002
Water Quality Complaints	292	159
Site Visits	252	130
Letters sent	3	3
Referrals	35	21
Resolved	151	114
Ongoing	0	0
Unresolved	141	45

In 2001, the most frequent water quality complaint involved discharges of chemicals (50%), which includes automotive fluids, oil, paint and unknown chemicals. This was followed by the category 'other' (33%), which includes miscellaneous discharges and grease. Debris (construction, commercial and residential) accounted for 10% of the complaints, while sewage constituted 4% and erosion 3%. These trends continue for 2002 (chemicals 47%, other 38%, debris 12%, sewage 6%, erosion 3%).

Whenever possible, cases are classified as unresolved or resolved. In 2001, 151 cases were resolved, while 141 cases remained unresolved. In 2002, the criteria for "resolved versus unresolved" was changed to better reflect the team's services. A case is now considered resolved if education and technical assistance are provided to the alleged violator(s) and/or the case is referred to an appropriate department or agency. The case is considered unresolved if the problem cannot be found or confirmed by SPU inspectors or if the original source cannot be identified.

Beginning late 2002 or early 2003, the water quality complaint database will be re-designed to better reflect the services the team provides. Our goal is to be better able to analyze and quantify the data we collect in the field and attempt to integrate our complaint database with our other technical assistance and outreach programs (business inspections and detention system inspections).

Ellen Stewart (206) 615-0023

3.4.3 Business Inspection Program

The goal of the Business Inspection Program is to reduce storm water pollution by encouraging businesses to implement appropriate best management and housekeeping practices in accordance with City code. Businesses with standard industrial codes (SIC) that match Ecology's list of SIC codes are inspected within a geographical region chosen by the City. All businesses are required to maintain drainage control systems and identify and remove illicit connections to the public storm drain system. Further, Inspectors use a list of HRPGA (high-risk

pollution generating activities) to assist in determining businesses that require additional operational source control requirements. A list of the most common targeted activities and appropriate BMPs are found in Table 2.

Table 2. Best management practices targeted during business inspections

Targeted Activity	BMP information provided/actions taken
Secondary containment	Education on definition, requirements, manufacturing, and/or purchasing of secondary containment
Spill response	Spill prevention plans and supplies. General cleanup procedures Disposal of cleanup materials: hazardous and non-hazardous Contact numbers for reporting spills
Chemical storage	Suitable storage containers and locations Secondary containment, covering
Employee training	Safety training. Spill response and reporting
Outside storage of parts & materials	Proper storage management practices
Vehicle washing	Educate about consequences of discharge, regulatory compliance, and voluntary connection to the sanitary system
Solid waste disposal	Education regarding impact of stormwater runoff to surface waters. Waste reduction
Solid waste storage	Impacts of runoff from open containers
Storm drain stenciling	Stencil drain with permission of the property owner
Condition/maintenance of private drainage systems (e.g., Catch basins, inlets, and oil/water separators)	Inspect catch basins, other drainage structures Educate about purpose and maintenance of catch basins, oil/water separators
Fleet vehicle facilities	Educate about appropriate location for fleet maintenance and fueling, if appropriate
Fueling stations	Educate about secondary containment, spill response.
Street, parking lot sweeping	Educate that sweeping is preferable to washing Proper disposal of sweeping wastes

For the year 2001, inspections were conducted in the Densmore, Norfolk, Thornton and Diagonal drainage basins. There were a total of 457 inspections, including 305 full onsite inspections and 152 drive-by inspections done, as well as 142 re-inspections to validate corrected problems. The types of problems found during 2001 and their frequency are listed in Table 3.

For the period January - June 30, 2002, there have been a total of 851 inspections conducted, including 217 full inspections and 634 drive-by inspections. In addition, 97 sites have been re-inspected thus far. These areas include the Densmore, Norfolk, Thornton and Diagonal basins. Inspections have been initiated in the South Park drainage basin. Additional inspections will also be completed in the Diagonal and lower Duwamish area in support of source control activities to be conducted under the Superfund investigation.

Table 3. Types of Problems Identified during Inspections

Type of problem	Number
Catch basin needs cleaning	125
Illicit connection	8
Vehicle washing	19
Parking lot washing	2
Automobile-related fluid in catch basin	3
Liquid storage area uncovered	6
Liquid storage area in unsafe location	22
Outside vehicle maintenance	12
Solid waste dumpster	11
Unkempt restaurant grease barrel	1
Missing trap on catch basin	3
No spill plan	95
No spill kit/material onsite	94
Total	401

An access database is being developed to aid in tracking of the business inspection program progress. This database is scheduled to be completed by the end of 2002. There are currently 3.75 FTE assigned to business inspections and source control investigations.

Ellen Stewart (206) 615-0023

3.4.4 Private Stormwater Detention System Inspections

Through June 30, 2002, SPU staff has conducted over 2668 inspections of privately owned stormwater detention systems since the Inspection Program began in 1991. In 2001, 537 inspections were completed, and 282 inspections have been completed during the first 6 months of 2002. A summary of the types of facilities inspected is presented in Table 1 below:

Table 4. Types of Detention Facilities Inspected in 2001/2002

Structure	2001	1 st half 2002
Flow control structures	595	389
Catch basins	1340	957+
Tanks	554	342
Ponds	12	5
Vaults	17	15
Oil/Water Separators	17	5
Pumps	50	16

Of the 819 sites inspected in 2001 and the first half of 2002, 44% were out of compliance with City Code, and in need of some level of maintenance or repair. Technical assistance is provided to property owners when they are informed of compliance needs. Removal of sediment, from flow control structures and/or onsite catch basins, was the most common maintenance need. Other common compliance issues include catch basins missing outlet traps, and missing, broken, or plugged flow control devices. Through the Private Detention System Inspection Program, 6 illicit connections were identified and corrected over the last 18 months. Only 3-percent of attempted inspections were unresolved, mostly due to difficulty accessing private property. In 2001, 64% of the property owners performed the necessary maintenance within 90 days of the initial inspection, with an additional 15% in compliance within

120 days (for a total of 79%).

Land use category of the sites inspected in 2001/2002 is shown below:

- 50 percent multi-family (apartments, condominiums, town houses)
- 45 percent commercial/industrial
- 5 percent other (schools, parks, public property, churches, etc).

Inspections of privately owned stormwater detention systems in the City of Seattle are performed by 5 members of the Surface Water Quality Team, each of whom have a portion of their workload assigned to this program. The inspection team is on pace for accomplishing its' 2002 goal of 600 inspections of private stormwater detention systems.

Inspections focus primarily on multi-family dwellings, commercial, and industrial properties. The initial canvass of the city has been completed, and files have been created for all known sites. A system for capturing new systems as they are built has been developed, and is undergoing refinement as the program evolves. As the plans for these new sites with stormwater detention and treatment become available, they are inspected. Detention systems serving single-family residences have not been inspected due to difficulties in gaining access. There are approximately 1000 known detention systems at single family residential sites, and an estimated 200 additional systems belonging to single family homes that have not yet been captured in the database. The total number of privately owned systems in Seattle is estimated to be 3,250 (+/- 200).

Inspection activity is recorded in both a paper file and an Access database.

Paul Kramer (206) 733-9162

3.5 STORMWATER POLLUTION PREVENTION

3.5.1 Household Hazardous Waste Program

The Household Hazardous Waste (HHW) Education program is a multi-faceted approach to educating the public, including the under-served community, about the proper use, storage and disposal of hazardous household products and about the availability of less toxic alternatives. SPU provides staffing to coordinate HHW education and collection programs as part of the LHWMP, to represent SPU on interagency committees and workgroups, and to help develop strategic policy, planning and budget proposals in support of SPU and LHWMP goals. Among the accomplishments during 2001:

- Successfully negotiated the funding of three new SPU initiatives - the ReUse Store, new staff for the Natural Lawncare Hotline, and an Environmental Health Justice Needs Assessment (phase 2 of the environmental justice project);
- Participated in the development of the HHW Education committee's new strategic plan. The five priorities of focus are pesticides, strong cleaners, solvents, automobile and boat products, and personal care products;
- Partnered with King County's to fund and oversee research on strong cleaners, including hiring an intern to conduct a literature review and one-to-one interviews, and consulting with a behavior change expert.

Kathy Minsch (206) 615-1441

3.5.2 Green Cleaning Kits

This program produces and distributes Green Cleaning Kits and Green Cleaning information primarily in the form of Green Cleaning Recipe Cards. In addition, the program conducts New Parent Workshops that use the kits to help established parent training groups learn about a broad range of hazardous household chemicals and healthful alternatives to these chemicals. In most cases, programmatic recipients of the kits are directed to use them as a means to begin an educational process about hazardous household chemicals that encompasses the more dangerous groups of cleaners. Among the accomplishments in 2001:

- Produced and distributed more than 2000 Green Cleaning Kits to support LHWMP program activities.
- Produced and distributed more than 16,000 Green Cleaning Recipe Cards.
- Continued offering a mini-kit to support LHWMP educational activities at a lower cost than full kits and with different pedagogical possibilities.

Michael Davis (206) 615-1376

3.5.3 Central Area Community Festival

The Eco-Village at the Central Area Community Festival was a collaboration between Seattle Public Utilities, Seattle City Light, Seattle Tilth and Seattle Master Composters to demonstrate what attendees could do in their home, yard, garden and community to protect the health of their family and the environment, and save money. Home Depot contributed and built a "model home and community". Many staff and volunteers were on hand to answer questions. Over 1000 attendees learned what they could do in their home (bathroom, kitchen and laundry room), yard/garden (Seattle Tilth) and community (anti-graffiti, illegal dumping, environmental stewardship) to protect the health of their family and environment and save money.

Michael Davis (206) 615-1376

3.5.4 Storm Drain Stenciling/Oil Spill Program

This purpose of SPU's Storm Drain Stenciling/Oil Spill Program is to educate the general public about pollution prevention and reduce pollution in the storm system. SPU provides storm drain stenciling and oil spill kits for community and business volunteers. Among the accomplishments in 2002:

- Increased the number of storm drains stenciled by school participants to 1,175.
- Facilitated the general public stenciling 2,461 storm drains.
- Supported 65 businesses participants in the Oil Spill Program

Carlton Stinson (206) 684-7624

3.5.5 Business and Industry Recycling Venture

SPU contracts with the Business and Industry Resource Venture, a component of Greater Seattle Chamber of Commerce, to increase business awareness and compliance with current

stormwater codes. The Resource Venture provides free information, education and technical assistance to help Seattle businesses improve all conservation practices. Their stormwater assistance focuses on informing the business community about current stormwater codes and educating high-risk pollutant generators about code specifics and best management practices. The Resource Venture reaches over 7,000 businesses per year through newsletters, trade publications, community presentations and phone and web resources. Direct stormwater assistance is provided to over 200 businesses per year through about 20 presentation or workshops per year and about 25 site visits.

Hans VanDusen (206) 684-4657

3.5.6 Hazardous Material Inventory

Every year for the past three years, SPU has conducted an inventory of hazardous materials used as SPU facilities. The scope of the 2001 inventory was expanded to include downtown buildings and office spaces as well as field facilities. Inventory information was entered into a database and the information made available on the City's internal web site. The 2002 inventory is complete and has been posted to the web site. These inventories form the basis for better management of hazardous materials stocks on hand and for the elimination of unused, outdated, or surplus chemicals that otherwise could end up in the environment (see below).

John Labadie (206) 684-8311

3.5.7 Hazardous Material Reduction

Throughout 2000 and 2001, SPU facilitated the roundup and exchange of excess re-useable hazardous products from SPU shops and facilities, which resulted in approximately 16,000 pounds of products no longer used or needed by the original owners. These products are first offered to various City Departments for re-use, and later offered to other users through the King County Local Hazardous Waste Management Program.

Shab Zand (206) 233-5172

3.5.8 Natural Lawn and Garden Care Campaign/Natural Soil Building

The Natural Lawn Care Campaign began in 1997 as a way to encourage residents to employ environmentally friendly lawn care practices. In 2001 the Campaign became the *Natural Lawn and Garden Care Campaign*. Incorporating a completely new set of five in-depth educational brochures, the "Naturals" were targeted at the regional gardening audience. The Compost Hotline became the Natural Lawn & Garden Hotline, expanding on the information disseminated. The *Mower For Less* regional mulch mower sales were expanded to include long handled weeding tools (an alternative to herbicide use) as a first step to transitioning the program to a full range of Natural Lawn & Garden tools in 2002.

At the same time the Backyard Composting Program was re-tooled into the Natural Soil Building Program. Education shifted from making compost to remove organic wastes from collection to a new emphasis on improving soil for multiple resource benefits. A new Master Composter/Soil Builder Training Manual was created, with volunteers receiving a broader education on how to create better soils. In addition, two new activities were added to the program. One, the Chip and Mulch Tour, encourages residents to join with neighbors to collect woody organic wastes too difficult for either home composting or curbside collection and, with the help of a tree service, grind these wastes for home mulching. Another new effort, the Industry Soils Collaboration, is an attempt to work with industry representatives on practical ways to

encourage better soil preparation on new construction projects regionally.

Carl Woestwin (206) 684-4684

3.5.9 Green Gardening Program

The Green Gardening Program continues to be implemented by the consultant team of Seattle Tilth Association, Washington Toxics Coalition and Washington State University Cooperative Extension. The program has been managed by SPU and funded by the Local Hazardous Waste Management Program (LHWMP) since 1993, with the goal of educating King County residents and landscape professionals about alternative pest management strategies in an effort to reduce pesticide use. Among the accomplishments in 2001:

- 737 people attended Green Gardening presentations. This figure includes 662 people attending one of the three regular Green Gardening slide shows, 17 low income and/or non-native (SE Asian & East African) residents of Seattle attending an eight-class translated series on gardening, 9 women attending a three class series through local women's shelters and 51 individuals attending one of three presentations through local homeowner's associations.
- Eight *Practical Gardener* columns on Green Gardening topics ran in the Sunday Seattle Times, including columns on compost tea, crane fly damage, the Bellevue Waterwise Garden, designing weeds out of the landscape, alternative controls for codling moth, crane fly: fact from fiction, and 2 columns on cherry bark tortrix.
- 122 Master Gardeners received 3 hours of Green Gardening training; 45 Master Gardeners were trained in presenting Green Gardening slide shows.
- 176 nursery staff plus 52 community college students and members of the Association for Women in Horticulture attended Green Gardening presentations.
- 365 professional groundskeepers (and some agency program staff) attended the annual Integrate Pest Management (IPM) Workshop for Groundskeepers. A total of 150 participants signed up for recertification credit for their pesticide applicator's license.
- Five new *Pro-IPM* fact sheets were created, bringing the total number available to local landscape professionals to 24. The new publications are on apple maggot, codling moth, cherry bark tortrix, peach leaf curl, and pear slug.
- New evaluation forms were designed for public presentations, nursery training events, and the IPM Workshop to measure behavior changes and use of *ProIPM* fact sheets. About two thirds of staff at nurseries responding to the nursery training evaluation indicated that they have changed product inventory based on Green Gardening seminars. 68% of responding participants at the IPM Workshop had seen the *Pro-IPM* fact sheets previously and 95% of those claim to have used them in their work.
- 150 nursery staff, landscape professionals and horticultural students attended 23 presentations on Green Gardening practices.

Carl Woestwin (206) 684-4684

3.5.10 Pesticide Reduction

It is the official policy of the City of Seattle to promote environmentally sensitive landscape pest and vegetation management by phasing out the use of the most hazardous pesticides and

reducing overall pesticide use while preserving landscape assets and protecting the health and safety of the public and our employees. A critical component of this policy is to provide training in reduction techniques to those who use pesticides. The City of Seattle's Environmental Management Program was developed in 1999 to promote environmental training and stewardship in City operations, which included reducing pesticide use. Seattle's pesticide use reduction strategy is an outgrowth of two policies developed under Seattle's Environmental Management Program: the *Landscape and Grounds Management Policy* and the *Chemical Use Policy*. To implement these policies, the *Landscape and Grounds Management Guidelines* were developed to provide a framework for environmental responsibility as the City plans, designs, constructs, and maintains City-owned land. These guidelines address and promote natural drainage and Integrated Pest Management (IPM). Employee-driven innovations have resulted in substantial reductions in the use of the most potentially hazardous pesticides. Over the past two years since the formation of Seattle's Environmental Management Program (since renamed: Office of Sustainability and Environment), there has been an overall reduction in pesticide use of 26% in 2000 and 24% in 2001. Sustaining and improving on these reductions is at risk as budget impacts reduce program and staff resources. The chart shows the estimated reduction in pesticide use for 2000 and 2001 against a baseline developed using average annual pesticide use over 1995-1999 period. Note that these trends are based on the best data available at the time and provide a good indication of the success of the program. As data quality improve, these measures of performance will become more robust.

Tracy Dieckhoner (206) 386-4595

3.5.11 Pesticide Free Parks

In a joint project involving Seattle Parks and Recreation and the Office of Sustainability and Environment, Seattle has designated six major and minor park locations as Pesticide-Free Parks. These locations will be maintained without the use of pesticides, providing City staff with the opportunity to better understand options for caring for lands with less reliance on pesticides *and* providing the community the opportunity to enjoy parks maintained without potentially harmful chemicals. The six featured pesticide-free parks are: TT Minor Playground, Webster Playground, Meridian Playground, Fairmont Playfield, Bradner Gardens Park, and Beer Sheva Park.

Tracy Dieckhoner (206) 386-4595

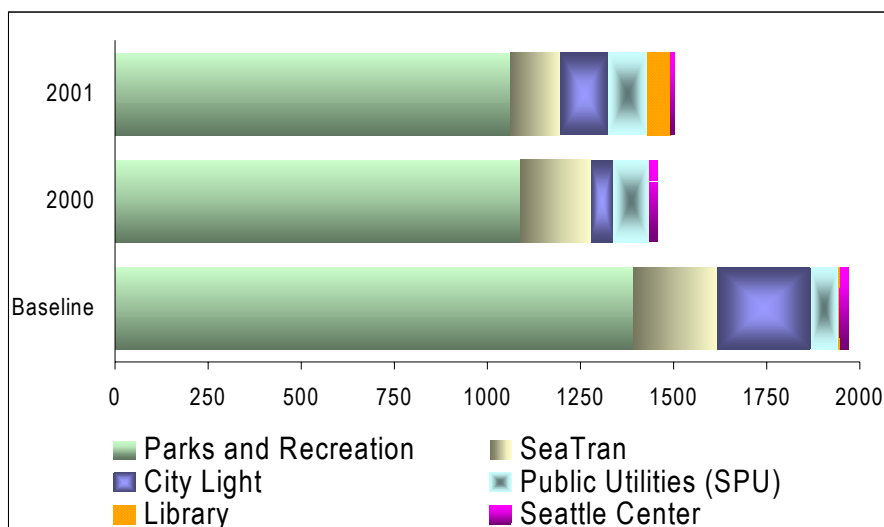


Figure 2. Citywide Pesticide Use
Total Pounds Active Ingredient (AI), 2000 & 2001 vs. Baseline Avg. (1995-1999)

3.6 ILLICIT DISCHARGES

In addition to the programs described below, investigation of illicit discharges and improper disposal of materials to surface water are also incorporated into a number of programs described elsewhere in this report, including Water Quality Complaints (Section 3.4.2), Business Inspection Program (Section 3.4.3) and TV inspections performed on storm sewers (See 3.8 Operations & Maintenance of Drainage System).

3.6.1 SPU Spill Coordinator/Response Program

In 1998, SPU implemented a Spill Coordinator Program to respond to hazardous material spills occurring in the Seattle service area. The role of the Spill Coordinator is to lead SPU response activities, including: evaluating hazardous substance spills, deciding how best to mitigate and clean up the spill, mobilizing and committing SPU resources, and overseeing the activities of a spill response contractor, if needed. Spill Coordinator coverage began in autumn 1998. Forty-two spills were reported during 2000, 28 of which required a spill coordinator program response, ranging from telephone consultation to on-site coordination. In 2001, there were 70 reported spills of which 60 required Spill Coordinator response. A Spill Coordinator is available 24-hours a day, including weekends, on a rotating 1-week duty schedule. At present, the network consists of 11 Spill Coordinators trained to the Hazardous Materials Emergency Response Technician level.

John Labadie (206) 684-8311

3.6.2 Illegal Dumping

SPU has developed a number of programs to respond to litter and illegal dumping activities in the city and to ensure the efficient collection of litter in public places. The objectives of these programs are to reduce or prevent litter activities, enforce city ordinances, facilitate community cleanup. An effective illegal dumping program reduces pollution being washed from our streets and alleys into the storm drains and receiving waters. Among the accomplishments in 2001:

- Resolved over 3500 cases, of which more than 3000 were reported over the Illegal Dumping Hotline (206-684-7587).
- Provided for the pickup, collection and removal of 2,500,000 pounds of illegally dumped materials on city streets, roads, and public areas.
- Participated in over 12 Home Cleanup events and over 100 neighborhood community meetings in support of cleanups by local chambers of commerce and with local business districts.
- In 2002, SPU sponsored 6 Use It Again Seattle events in neighborhoods around the city where people brought in usable furniture and other items for others to take home. The City also sponsored five Clean Seattle events.

Alex Tonel (206) 684-4170

3.7 PUBLIC INVOLVEMENT, EDUCATION, STEWARDSHIP

3.7.1 Citizen Advisory Committee

Seattle Public Utilities sponsors several Citizen Advisory Committees. The advisory committee most involved with stormwater-related issues is the Creeks, Drainage and Wastewater Advisory Committee (CDWAC). This committee sets its own work plan and operating procedures with input from staff. Decision-makers within SPU are regularly briefed on committee actions and input, and emphasis is placed department-wide on responding promptly to committee recommendations. The membership of this committee includes citizens with professional background in the subject area and representatives of relevant stakeholder groups to provide a diversity of viewpoints. This committee meets on the second Wednesday of each month.

Carlton Stinson (206) 684-7624

3.7.2 Environmental Education Team

The Environmental Education Team works with both public and private partners to provide an integrated program provide a range of environmental messages encompassing solid waste, hazardous waste, recycling, water quality/drainage, and water conservation. SPU supports students through curriculum assistance and field trips that connect students with the environment outside the classroom. Among the Team's accomplishments in 2001:

- Completing and signing MOU with Seattle School District for integrated environmental programs for 4th and 5th grades.
- Conducted two in-house staff cross-training sessions to get all staff up to speed on all our environmental messages.
- Revamped the Salmon in Class program into a Salmon in School focus.
- Aligned Salmon in School and water education offering with school district and State curriculum standards.
- Developed agreement with Metro-Center Earth Service Club to provide support in 9 of 10 Seattle High Schools.
- Funded Professional Development for teachers for integrating SPU messages in classroom presentation and academic curriculum.

- Partnered with Cedar River Environmental Education Center staff to ensure coordinated service delivery efforts.
- Conducted and completed several teacher focus group sessions.
- Conducted program evaluations of Salmon in Schools and Living Wise.
- Contracted with Thornton Creek Project to deliver service to youth and support curriculum enhancements with Seattle teachers and staff.
- Continued agreement with Pacific Science Center, Mercer Slough Grant to support watershed internship with high school students in southeast Seattle.

Anthony Matlock (206) 386-9746

3.7.3 In Concert with the Environment (ICE)

This program educates middle school students in grades 7 and 8 on how to make informed choices about the use of natural resources. Students learn basic concepts at school by being involved in problem-solving activities, and at home where they conduct audits of resource use in partnership with their parents. Audit information is used to generate personalized action plans that they then implement at home. The program is jointly sponsored by SPU, Seattle City Light and Puget Sound Energy in partnership with Seattle, Highline and Shoreline Schools. Among the accomplishments in 2001:

- Program is active in 8 of 10 Seattle Middle Schools, and one middle school each in Highline and Shoreline districts, which are within the SPU direct service area.
- Student participation in the program in spring and fall 2001 exceeded 1800.
- Over 3000 parents were involved in at home activities.
- Information on SPU natural resource programs (creeks, graffiti etc.) was distributed
- Follow-up surveys indicate a 98% teacher satisfaction with the program and a 60% increase in student awareness of efficient natural resource use.

Mike Mercer (206) 684-0570

3.7.4 Salmon in the Schools

The Salmon in the Schools program gives students hands-on activities and field trips to enhance current environmental curriculum taught by Seattle teachers. Raising salmon in the classroom helps get students interested and involved in their watershed and provides an opportunity for learning what they can do to protect the environment. Additionally, three field trips are organized around the classroom project. First to the University of Washington Fish Hatchery, then to the Seattle Aquarium, and finally to a local lake or stream where students plant their salmon fry that they have raised for the past seven months. Among the accomplishments in 2001:

- Program completed its 11th year.
- 110 Seattle schools participate in the program.
- Program adjusted to be more in line with the school districts academic programs, now serving only 4th and 5th grade.

- Program credited with influencing about 30,000 Seattle students (some directly and some by observation as the tanks are placed in common areas in many schools).
- Students plant over 20,000 salmon fry into local streams.
- 85% of teachers surveyed rated it among the top programs.

Carlton Stinson (206) 684-7624

3.7.5 Environmental Grant Funding

The Environmental Grant program provides funding support for community groups to do one-time, short-term projects that protect, educate and involve communities in educating and protecting our natural resources, with respect to water quality, solid waste, and litter and graffiti. During 2001 SPU funded 26 community stewardship and educational projects related to stormwater pollution prevention and water quality for a total of approximately \$8,500. These included eight natural drainage projects, eight natural gardening and landscaping projects, eight education projects, one street leaf composting project, and a cleanup event in the Ship Canal.

Anthony Matlock (206) 386-9746

3.7.6 Urban Creeks and Watershed Stewardship

The Urban Creeks and Watershed Stewardship program consists of several approaches towards educating and involving Seattle's communities in stewardship of their local urban creek watersheds in order to help the city maintain, restore and protect them. Watershed educators run the Pipers Creek and Longfellow Creek watershed programs with input from community-based watershed councils and groups to implement two watershed plans. The new Urban Creek Stewardship program evolved from SPU's Urban Creeks Legacy program and was launched in 2001. It is oriented towards engaging the community in volunteer creek steward projects and educating them on the value of creek ecosystems and the impacts of human activities. SPU also contracts with the Thornton Creek Project to conduct watershed education in the Thornton Creek watershed in response to the draft Thornton Creek Watershed Action Plan. SPU also supports the new community-generated watershed plan and council in the Fauntleroy Creek watershed.

Kathy Minsch (206) 615-1441

Creek Steward Program

The Creek Steward Program provides opportunities to learn about our creek systems and get involved in sustaining Seattle's urban creeks. Through partnerships with Seattle Parks and Recreation (SPR) and other agencies, local community groups, businesses, schools and individuals, the Creek Steward program restores riparian vegetation, maintains existing plantings, monitors creeks and salmon, and educates citizens in best management practices to benefit our urban creeks. Among the 2001 accomplishments:

- Hired new Creek Steward Coordinator in June. A Creek Steward Program brochure to was developed to provide information and recruit prospective volunteers. Over 280 volunteers participated in Creek Steward events in the six months following the hiring of the Program Coordinator.
- Conducted two workshops in partnership with SPR, training 37 volunteer Creek Steward Team Leaders in volunteer coordination, watershed and stream concepts, plant

identification, planting, and weed removal.

- Recruited ten Site Stewards in four watersheds. Site Stewards provide long-term care and maintenance for established sites along Seattle creeks.
- Piloted volunteer macroinvertebrate monitoring with SPU monitoring staff. Six training sessions were held for volunteers, preparing 45 individuals to sample sites in 6 different creek systems.
- Supported seven invasive weed removal events resulted in 10 truckloads of weeds removed from areas adjacent to Seattle creeks. Over 400 native trees and shrubs were planted along urban creeks.
- Met with and built relationships with leaders of Thornton Creek Alliance, Thornton Creek Project, Carkeek Watershed Community Action Project, Friends of Deadhorse Canyon (Taylor Creek), Longfellow Creek Watershed Advisory Council, and Friends of Fauntleroy Creek. Initiated relationships with internal staff in Capitol Improvement Project and Operations and Maintenance groups to identify increased opportunities for volunteer involvement. Established new business volunteer partners including Puget Consumer Coop, Tom's of Maine, Washington Mutual Bank.
- Sponsored Creek Week as part of Earth Day 2001, supporting and promoting creek volunteer events in several watersheds.
- In the spring of 2002, held the first of four Creek Friendly Gardening workshops in partnership with Seattle Parks and Recreation, including the planting of a demonstration garden at a local community center in the Longfellow Creek watershed.

Bob Spencer (206) 684-4163

Longfellow Creek Watershed Project

The *Longfellow Creek Watershed Action Plan*, an interdepartmental document, currently guides the work of the Watershed Specialist. The Plan outlines commitments made by cross-jurisdictional partners, including Seattle Public Utilities, Seattle Parks, other City and County agencies, community groups and Neighborhood Councils. This work is carried out in coordination and collaboration with the above groups as well as with businesses, schools, citizens, hired consultants and subcontractors. Among the accomplishments in 2001:

- Longfellow Creek Legacy Trail project received a \$100,000 Neighborhood Matching Fund Grant (awarded to the Longfellow Creek Advisory Council, Delridge Neighborhoods Development Assn. and Westwood Neighborhood Council).
- Completed 1st "Gateway" to the trail at Roxhill Park (headwaters of Longfellow Creek).
- Longfellow Creek movie shown at Admiral Theatre in West Seattle from January -June; accompanying lobby display resulted in 65 new volunteers.
- Cooperatively planned and conducted four community panel discussions on restoration/landscaping issues with UW Center for Urban Horticulture's Sustainable Community Landscaping group.
- 75 community members, Mayor and elected officials celebrated citizen involvement in the watershed at "Longfellow Creek is Longing for You" event.

2001 Update Report

- 900 students from 15 elementary schools participated in 4 hour naturalist-led programs at Longfellow Creek/Camp Long. Programs focused on watersheds, pond, forest and riparian habitats and water quality.
- 30 Washington Mutual volunteers contributed 6 hours to Longfellow restoration efforts at the Countywide Day of Caring.

Sheryl Shapiro (206) 233-2046

Pipers Creek Watershed Project

The *Pipers Creek Watershed Action Plan for the Control of Nonpoint Source Pollution* (1990) outlined a series of recommendations, which included providing a Watershed Interpretive Specialist to help develop and coordinate community outreach on watersheds and water quality. A review of the Plan was completed in 2000, which include new recommendations to further meet the goals of the Watershed Action Plan. Among the accomplishments in 2001:

- 1,669 students from more than 15 schools participated in 1.5 to 2 hour-long naturalist programs at Carkeek Park. Programs focused on habitat and clean water, and included activities in the wetlands salmon return.
- 17 Salmon and Wetland Stewards received training on a variety of topics related to wetlands and watersheds in the Park. Stewards volunteered over 200 hours on public education and stewardship projects.
- The 2001 Pipers Creek Salmon Return Celebration on November 23rd was attended by between 250 and 300 citizens.
- The 10-year retrospective report card on the Pipers Creek watershed was produced and distributed.
- A Public Involvement and Environment (PIE) Fund contract from the Puget Sound Water Quality Action Team was awarded for "Living Green in Pipers Creek" program on sustainable watershed practices through Carkeek Environmental Education Center.
- The Pipers Creek Watershed's Greenwood Seafair parade entry was a human stream of 40 blue children and adults surrounded by salmon, bugs, trees and storm drains. Estimated parade attendance is 10,000 people.
- Cooperatively planned two volunteer street tree plantings with Seattle Transportation.

Beth Miller (206) 684-0877

Taylor Creek and Deadhorse Canyon

Located in Southeast Seattle, Taylor Creek is a small creek that flows from the Skyway District of King County and into Lake Washington at 68th Avenue South. Most of the reach that flows through Seattle proper is within Lakeridge Park and has formed Deadhorse Canyon. Though greatly improved over past years, the area continues to suffer from an infestation of invasive weeds. Volunteers have been trained to recognize invasive weeds and in proper planting techniques for native species. We have partnered with the Seattle's Parks and Recreation Department, King County, and the local community (many of whom are from outside Seattle City limits) to improve riparian and upland habitat of the canyon area of the watershed. Taylor Creek is becoming a popular place to bring school groups and is a model of good partnership.

Among the accomplishments in 2001:

- Planted over 7,000 individual Northwest native plants in the watershed.
- Removed over 40 cubic yards of invasive weeds such as ivy and blackberry.
- 320 individuals donated over 2000 hours of volunteer work to habitat improvement (the “core” volunteer base is about 30 individuals).
- 150 elementary and high school students toured the site and performed volunteer work.
- Supplied the “Friends of Deadhorse” with \$15K worth of hand tools including shovels, trowels, wheelbarrows, spades, etc.

Tom Gannon (206) 684-8565

Bob Spencer (206) 684-4163

Taylor Creek Environmental Watershed Internship

The Taylor Creek Internship program provides high school students with opportunities to learn more about the Taylor Creek Watershed in Southeast Seattle through direct involvement in monitoring its health and partnering with elementary school students to share how they can be stewards. Interns from Southeast sector high schools are hired annually by Pacific Science Center and are supervised by staff from their program at Mercer Slough in Bellevue. Interns participate in regular meetings to coordinate their activities, are trained to conduct water quality monitoring in the creek, assist elementary school classes on watershed activities, and participate in several restoration work parties in the community. Among the accomplishments in 2001:

- Number of interns participating was eight from two high schools for 2000-2001 school year and ten from three high schools for 2001-2002 (including 5 volunteer interns).
- Expanded program in Van Asselt Elementary to reach 167 fourth and fifth grade students.
- Established partnerships with Friends of Deadhorse Canyon and Rainier Beach Community Center.
- The Pacific Science Center was awarded a Public Involvement in Education (PIE) grant late in 2001 from the Puget Sound Water Quality Action Team based on the previous success of the program
- Conducted on-going watershed monitoring activities include regular water quality tests.
- Program participants supported several work parties and Earth Day festivities

Kathy Minsch (206) 615-1441

Fauntleroy Creek Watershed

The Fauntleroy community has long supported education, restoration, and stewardship activities and projects in the Fauntleroy Creek watershed. Such strong community leadership has resulted in many partnerships with City departments, local and regional schools, non-profit organizations, art groups, King County, universities and the state of Washington. This has prompted the state to improve habitat and salmon runs in the creek, and to educate and involve school children and the public on the value of improving and protecting an urban creek

watershed. In 2000 the community received a grant from SPU to develop a watershed plan, which included a watershed analysis and action recommendations. This plan was completed in 2001, and there is a watershed council to oversee all projects and activities in the watershed. Among the other accomplishments in 2001:

- Coordinated within SPU and with Seattle Parks and Recreation on the watershed action plan recommendations involving city responsibilities.
- Co-sponsored Nature Night, an annual education event targeted to new watershed residents (families)

Kathy Minsch (206) 615-1441

3.8 OPERATIONS & MAINTENANCE OF DRAINAGE SYSTEM

SPU Drainage and Wastewater Operations Division is responsible for drainage system maintenance for culverts, pipes, inlets, catch basins, sand boxes, trash racks, and ditches (mowing and clearing debris). Table 5 and Table 6 list the different activity accomplishments that occurred during 2001.

Table 5. 2001 Quarterly Totals

Main Line Cleaning	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total lineal feet
Hydrocut	821	332	855	1,709	3,717
Machine Rotting	255	2,080	574	739	3,648
Jet Cleaning	1,555	6,835	3,902	1,081	13,373

Main Line TV Inspection	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total lineal feet
TV Line	3,551	12,660	3,809	12,158	32,178

Table 6. 2001 Drainage Maintenance

Activity	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Mechanical Clean-Catch basin/Sand box	2,125	2,293	2,006	1,191	7,615
Manual Clean Inlets	7,538	5,450	4,552	3,219	20,759
Power Rotting*	5,846	3,901	5,864	2,493	18,104
Inspect Catch Basin/Sand Box	8,513	10,023	8,050	3,480	30,066
Repair/Replace Drain Structure	51	122	118	75	366
Maintain Ditches*	36,841	67,069	50,853	30,188	184,951
Closed circuit TV Inlet/Outlet Pipes*	345	235	145	509	1,234
Clean Settling Basins/Ponds	55	57	51	35	198
Jet Cleaning*	21,971	18,636	13,695	16,544	70,846
Clean Bridge Drains	210	2,243	158	427	3,038
Hydrocut*	155	850	521	180	1,706

* lineal feet

Pat Gorham (206) 386-9730

3.9 OPERATIONS AND MAINTENANCE OF ROADWAYS

Seattle Department of Transportation (SDOT) Street Maintenance Division has a staff of approximately 80 field and management personnel involved in street sweeping and de-icing. The City has nine sweepers that follow a schedule (weather permitting) of cleaning public streets and roads. Industrial and commercial areas are regularly swept on a rotating basis. Bike paths are cleaned approximately once a month. In addition, roadways known to receive a significant number of leaves receive repeated visits during autumn. Street cleaning crews also respond to emergency calls, for example oil spills on the roadway, which are typically cleaned up with absorbent pads, booms or spag. During winter, the City uses both sand and anti-icing and deicing products to aid traffic during freezing weather. Street sweepers are used to pick up any remaining sand after it is no longer required. In 2001, there were approximately 29,500 curb miles of streets swept. Litter control is the responsibility of the SPU Community Services Division, which coordinates a number of volunteer programs to help keep the City's roadways clean, such as Adopt-a-Street, Neighborhood Cleanup, and Spring Clean. Table 7 shows the 2001 S SDOT Street Maintenance accomplishments and budget for drainage-related work.

Table 7. Selected 2001 expenditures for Street Maintenance

Activity	Accomplishments (Units)	2001 Expenditures
Mechanical sweeping	29,495 Curb Miles	\$1,281,743
Street flushing	90 Work Miles	\$5,782
Alley flushing	11,126 Alley Blocks	\$184,460
Snow & ice response	2,874 Labor Hours	\$181,092

In 2001, the City of Seattle SDOT, SPU, and Parks & Recreation began implementing elements of Regional Road Maintenance Program National Marine Fisheries Service Section 4(d) Rule of the Endangered Species Act. In 2002, SDOT updated its standard practices to align them with best management practices in the Regional Road Maintenance Program and Draft NPDES Stormwater Permit.

Jim Dare (206) 684-5319

3.9.1 ESA Regional Roads Maintenance Program

In January 2002, the National Marine Fisheries Service (NMFS) published the Regional Road Maintenance ESA Guidelines (Guidelines) in the Federal Register. These Guidelines are the product of a lengthy collaborative effort between local government agencies, NMFS, the United States Fish and Wildlife Service (USFWS), and other interested parties. The Guidelines provide a set of road maintenance policies and practices that will meet the dual goals of contributing to the conservation of ESA listed species while meeting critical roadway safety and maintenance needs. While not formally applying to NMFS for program approval, Seattle's Department of Transportation, SPU, and Parks are now incorporating many road maintenance best management practices (BMPs) and an in-depth workforce training into its programs.

Sandy Gurkewitz (206) 684-8574

3.10 MUNICIPAL TRAINING

3.10.1 Drainage Maintenance Crew Training – Standard Operating Procedures

In 2001, SPU initiated a program designed to address routine maintenance and repair work on drainage infrastructures located within environmentally sensitive areas. Such areas include both fish and non-fish bearing streams, plus ditches that have the potential to impact creeks. Standard Operating Procedures (SOPs) have been developed as part of this maintenance program, describing appropriate Best Management Practices (BMPs) to be included as part of the maintenance activity to protect the creek in which work was being conducted and to the resources downstream of the work area. The focus of each SOP was to avoid adversely impacting water quality, primarily by containing loose sediment and containing turbidity to inside the isolated work area. The SOPs were developed to provide guidance and standards to drainage maintenance crews that conduct routine maintenance to the drainage infrastructure within environmentally sensitive areas on a regular basis. The program addresses these following activities:

- *Sediment Removal* - the removal of excess sediment from the drainage system including, catchbasins, culverts and deposition areas within creeks and ditches, that is creating a conveyance problem;
- *Creek Structure Maintenance* - re-anchoring, repair, removal, or replacement of creek

structures (rock or boulder weirs, logs, root wads, El-wood, boulders) placed in the creek as part of a restoration project;

- *Ditch Cleaning/Reshaping* - cleaning/reshaping of ditches that have potential to impact a creek;
- *Culvert Repair* - repair of culverts located within creeks or ditches with potential to impact a creek;
- *Minor Bank Stabilization* - stabilization of stream and in-line pond banks, and the banks of ditches that have potential to impact a creek. This work only includes minor stabilization that can be considered maintenance to prevent bank sloughing or continued erosion;
- *Hydrocutting* - hydrocutting of roots, grease and miscellaneous debris within pipes located within a sensitive area or ditch with potential to impact a creek in order to provide proper conveyance;
- *Trash And Debris Management* - removal of trash and organic debris from creeks and from ditches that have potential to influence a creek;
- *On-Line Pond Maintenance* - general maintenance work within a retention/detention pond that is hydraulically connected to a creek. Work could include, but is not restricted to, sediment removal, repair or replacement of natural structures, such as LWD, repair of existing culverts, debris and trash removal, or vegetation establishment and maintenance.

Crews involved in conducting these types of maintenance receive ongoing training in these SOPs.

Shanti Colwell (206) 386-1501

3.11 INFORMATION & DATA COLLECTION, MANAGEMENT & ANALYSIS

This section highlights some of the activities conducted during this reporting period the support decision making, project design, and programmatic modifications. It includes not only on-going data collection and analysis efforts, but also summarizes some of the underlying tools that support data and information management.

3.11.1 Information Support Programs

Precipitation Monitoring

Currently, there are 17 rainfall-monitoring stations located throughout the city. Rain gauge 14, located in West Seattle High School at Walnut Ave. SW and SW Winthrop St. was not functioning for several months of the year 2001, owing to construction activities and having the rain gauge removed. No major upgrades, expenditures, or maintenance were performed in 2001. Table 8 provides average monthly rainfall accumulation. The average annual rainfall accumulation in Seattle in 2001 was 31.19 inches.

Table 8. Average Monthly Accumulations in 2001 in inches

Jan	2.71	Jul	0.87
Feb	2.25	Aug	1.68
Mar	2.41	Sep	0.54
Apr	2.04	Oct	3.44
May	0.95	Nov	8.05
Jun	2.54	Dec	5.00

Hirad Mousavi (206) 615-0826

Surface Water Quality Database

SPU staff maintain a Microsoft Access database of all surface water quality complaint investigations, source control business inspections, monitoring and sampling data. This database is updated and backed-up weekly, and is stored indefinitely. The surface water quality database is accessible to all SPU staff.

Mike Hinson (206) 733 9134

GIS Support

The history of Seattle's Geographic Information System (GIS) spans over 18 years. Evolving from a small installation in the former Seattle Engineering Department, the City's GIS was originally built to improve the way the City manages and operates its utility infrastructure. Seattle's GIS capabilities are now firmly entrenched within the daily business functions of most City Departments. Available GIS data can be combined to produce a wide variety of maps and/or to perform analysis. The City's GIS is used to inform decision makers and planners, help deliver services to the public, dispatch Police and Fire personnel, and manage City real estate. The City of Seattle's GIS base map, referred to as the Central Geographic DataBase (CGDB), consists of six GIS databases. These six base layers are the foundation for the City's geographic systems environment and are the shared layers to which all other thematic GIS layers are spatially registered. The CGDB is composed of the legal layer (lots, plots and plats), the survey control layers, Parcels, the Street Network database, Topography and the Orthophoto layer. This set of base layers is accurate to +/- 1 to 2 feet and was constructed using a combination of existing coordinate information, Global Positioning Satellite (GPS) surveys, photogrammetric densification, and calculations based on plat information and other survey data. The result is one of the most spatially accurate sets of GIS base layers in the country.

SPU's operational Sewer and Drainage GIS layer contains over four million records representing all sewer and storm drain mainlines and service laterals. It was built over a period of three years from two main information sources: the Side Sewer Cards and the original CAD-based Truck Set maps. Today's system is maintained by a SPU staff of three and produces a variety of hard copy custom and standard map sets (e.g. 200-scale maps, Truck Set maps). City staff have direct access to the data through easy-to-use custom interfaces.

The primary focus for the sewer and drainage GIS continues to be on data accuracy. Resources are devoted to address missing or errant mainline data, improve the connection to SPU Infrastructure Management System (IMS), and address the backlog of sewer plat changes. A tremendous number of changes have been made to the system, but the work is not yet complete. The focus on data accuracy will continue through 2003. Other projects in process include 200-scale map enhancements, integration of the highly detailed CSO data, network

connectivity for the pipe layers to support source tracing, and the creation of fixed-in place text for 50-scale mapping purposes. The recently completed 200-scale mapping project that compared the 10-year old, manually drafted 200 scale maps to data contained in the GIS was a clear success for the Utility. The result was some significant improvements to the data in the terms of locating missing infrastructure previously not present in the GIS.

Harvey Arnone (206) 233-0028

Comprehensive Creek Inventory

Completed in early 2002, the purpose of the Comprehensive Creek Inventory was to investigate and assess the current conditions of Seattle's smaller stream systems. This study expanded documentation of these systems, field checked the GIS streams coverage, and provided the framework for developing criteria for future SPU involvement in urban streams. Stream investigations were performed through visual and photo documentation. Depending upon terrain and private/public property issues, surveys were conducted by walking the stream channel, spot checking the stream at key locations, or a combination of both techniques. Stream information was recorded on base maps created using the City's GIS system. Information on stream channel conditions, streamside vegetation, canopy cover, locations of storm drain outfalls and other utility structures were recorded. The City's stream GIS coverage was also field checked for accuracy and updated as required. Unique stream features and problem areas were documented and photographed. Once the stream had been surveyed, information was collated and transcribed onto new maps, photos were identified and labeled, and a compendium of stream information was assembled into notebooks.

Joe Starstead (206) 684-7877

Ditch and Culvert Inventory

The Ditch and Culvert Inventory project represents on-going and expanded data collection, analysis, and management of the city's informal drainage system (i.e., ditch and culvert). In addition to completing the ditch/culvert inventory, other information needs have been identified. There is a need to determine the optimum ditch configuration at it relates to flow conveyance, water quality and maintenance. In addition, other factors may guide ditch design and maintenance such as public safety, proximity to landslide areas, type of street, infiltration potential and geographic location. The project objectives include:

- Create categories of ditch types (e.g., "normal" ditches, those within close proximity to a creek, those near landslide-prone areas) that can be mapped on the City's GIS drainage layer.
- Determine what these different ditch types require in terms of design specifications. Requirements will vary based on site characteristics and objectives.
- Develop guidelines for ditch maintenance and rehabilitation on existing systems as well as for new ditches.
- Identify those existing ditches that require rehabilitation.

Work to date conducted by City field crews has involved the use of a Global Positioning System (GPS) to map locations and selected attributes (e.g., width, depth, etc.) of the surface drainage system. The information has been downloaded into the City's Geographic Information System (GIS). Through mid-2002, approximately 1000 miles of City right-of-way have been mapped

using this technology.

Darla Inglis (206) 233-7160

Stormwater Structural BMP Mapping

Structural BMPs have been mapped using GPS and a GIS database of these sites now exist. The mapping identifies the location and type of BMP, which also supports crews to establish a maintenance schedule for the various sites.

Darla Inglis (206) 233-7160

Basin & Creek GIS Delineation

Beginning in the fall of 2001, SPU began updating the creek watershed boundaries in GIS for Thornton, Taylor, Fauntleroy, Longfellow, Schmitz and Pipers creeks using new and revised ditch, culvert and topographical information. Within each of these creek watersheds, SPU has also been delineating outfall sub-basins using GIS mainline data, topography, and ditch and culvert data. The creek delineation is currently about 90% complete and delineating outfall sub-basins within these watersheds is approximately 80% complete. In 2002, SPU began also annotating smaller creek basin boundaries and started delineating drainage basin boundaries for major outfalls discharging into the Duwamish River and Elliott Bay.

Scott Reese (206) 733-9172

3.11.2 Receiving Waters

Urban Creeks Watershed Analysis

The Urban Creeks Watershed Analysis is a study assessing the condition of six watersheds in the City of Seattle – Thornton, Piper's, Longfellow, Taylor, Fauntleroy, and Schmitz creeks. The purpose of the study is to provide a technical information base for decision-makers planning projects and programs that affect fish and habitat in Seattle's creeks. The study assesses fish use in each system, including existing and potential distribution, passage for migration, changes in the annual distribution of spawning activity and of juvenile production. An analysis of physical data is currently underway to help develop an understanding of how watershed processes affect the availability and condition of habitat in each system. Physical data include: habitat quality, channel conditions, riparian conditions, geology, and land uses. Field inventories are completed, and the data are being transferred to the City of Seattle's Geographic Information System (GIS).

Katherine Lynch 206-233-5194

Aquatic Community Assessment Program

The aquatic community assessment program is in its seventh year. In 2001, sixty samples of creek benthic macro-invertebrates (small creatures living at the bottom of a creek) were gathered from the substrate of twenty sites located in seven Seattle creeks and their tributaries. One important change this year was that trained volunteers from the community collected the samples rather than SPU staff. In April 2001, when the sampling results came back from the lab, the volunteer monitors were invited back for an analysis workshop. The samples were collected from Fauntleroy, Longfellow, Pipers, Ravenna, Schmitz, Taylor, and Thornton Creeks and several of their tributaries. SPU continues to use regionally developed sampling protocol,

converting the raw data into the regionally accepted Benthic Index of Biotic Integrity (B-IBI). A problem that has emerged in the analysis of aquatic macroinvertebrates in heavily degraded urban environments is the low overall number of individuals, which decreases the confidence level in the data analysis. To solve this problem in 2002, the area of the creek bed sampled will be doubled and the replicates will be pooled in the field before being analyzed. In general, Seattle's urban streams suffer from low abundance and low variety in aquatic invertebrates. An environmental statistician is reviewing the data record for this program and will be analyzing results over time as well as suggesting improvements for data analysis and data storage in 2002.

Laura Reed (206) 615-0551

Storm Event Sampling

A storm event is defined as a storm that lasts for a minimum of 4 hours and contributes at least 0.1 inches of rain with an antecedent dry period (less than 0.01 inches of rain) of at least 8 hours. Storm event samples (flow-weighted composite samples) are collected at the following four locations:

Pipers Creek basin:

Venema Creek at the mouth

Pipers Creek at footbridge downstream of Venema Creek

Pipers Creek above orchard

Longfellow Creek at Graham Street

For the period January 2001 through June 2002, storm samples were collected at the 3 Pipers Creek stations on the following dates (4 storm events sampled at each station):

April 10, 2001

Aug 21, 2001

Nov 13, 2001

During the same period, samples were collected during the following three storm events at the Longfellow Creek station:

Dec 13, 2001

Jun 27, 2001

Mike Hinson (206) 733 9134

3.11.3 CIP Support Monitoring

Hydrologic Monitoring of Natural Systems

In 2001, SPU completed an initial study of the hydrologic performance of its two pilot natural systems projects located in the Pipers Creek Watershed. Working in conjunction with the University of Washington, the study examined the hydrologic and hydraulic performance of the Viewlands swale and the Street Edge Alternative or SEA Street projects using post-construction monitoring and theoretical pre-construction runoff estimates. (See Section 3.12.1 for a description of these two sites.) In general, the studies indicated that the Viewlands Swale was able to attenuate runoff volumes generated from the 6-month, 24-hour storm event, and there was a roughly one-third decrease in flow volume from inlet to outlet based on the storm events

measured during the monitoring period. Initial runoff analysis at the SEA Street location indicated that there was a reduction of over 95% over the monitoring period.

Darla Inglis (206) 233-7160

BMP Evaluation for Informal Drainage Areas

After developing a comprehensive spatial database of Seattle's informal drainage system, it was necessary to devise a methodology that could use this database to identify available locations within existing street rights-of-way for stormwater BMPs to be constructed. This study, completed in March 2001 by the University of Washington, not only created such a system, but also developed a system for prioritizing potential BMP projects based on each site's relative proximity to natural receiving waters and amenability to BMP installation.

Darla Inglis (206) 233-7160

CIP Performance Evaluation

During 2001 and the first half of 2002, SPU continued a long-range monitoring program for SPU creek restoration projects to determine whether or not they are meeting their design goals. (The type of monitoring conducted at each project site depends on the goals of the project.) High priority in-stream construction projects are located in Pipers Creek, Thornton Creek, Longfellow Creek, and Taylor Creek. The following types of structures are monitored: log weirs, rock weirs, "el-wood" structures, off-channel pools, bank protection, gravel introduction, pool addition, fish passage weirs, lunkers, root wads, and riparian replanting. The purpose of CIP effectiveness monitoring is to provide information on the level of improvement or protection afforded a water body as a result of the constructed system or BMP. This information will refine stormwater management decisions and advance the benefits gained by strategically investing in the most effective activities and projects.

In 2001, a change was made in the tracking system for the creek restoration monitoring. Instead of listing individual structures as monitoring sample sites, structures are grouped together at each restoration site. The following table shows the distribution of new sites requiring monitoring through time. Each site is monitored at least annually.

Table 9. Number of CIP Performance Sites

Year	No. of sites requiring monitoring
1999	8
2000	5
2001	3
2002	4
Total	20

A technical report, summarizing the information gained from three years of monitoring on the oldest sites, is being written in the second half of 2002.

Laura Reed (206) 615-0551

Bitter Lake & Haller Lake Stormwater Quality Studies

Two studies were conducted as a collaborative effort between SPU and Seattle University. Completed in May 2002, the objectives of the studies were to summarize storm water treatment technologies and, for each lake delineate drainage basins, identify stormwater contaminants

entering the lakes, and perform a preliminary engineering analysis for treatment alternatives.

Beth Schmoyer (206) 386-1199

BMP Effectiveness Monitoring

The City of Seattle is a participating agency in a project designed to evaluate structural best management practices (BMPs) that remove pollutants from stormwater runoff. With Washington State Department of Transportation (WSDOT) serving as the lead agency, this project designed a test bed facility where highway runoff is routed from a section of Interstate 5 into located in WSDOT right-of-way under I-5 immediately north of the Lake Washington Ship Canal. The runoff can be piped into as many as four installed BMPs, with sampling ports located so that flow rates and chemical concentrations can be determined at entry and exit points in each BMP. Designed as a long-term monitoring and research project partnership between WSDOT, the City of Seattle, and other participating jurisdictions, funding fell short precluding much progress in 2001. SPU has purchased Stormwater Management Technologies filter media system to be installed and tested at the facility in 2002/2003.

SPU is also evaluating the performance of a Downstream Defender and Vortechs swirl concentrator under a grant from Ecology. Field sampling began in 2001 and as of June 2002, four storm event samples had been collected at each site.

Beth Schmoyer (206) 386-1199

Ditch/Culvert Identification, Prioritization & Maintenance Guidelines

In 2001, the University of Washington completed a study of SPU's Comprehensive Ditch and Culvert Program. The purpose of the program is to improve the quality of stormwater runoff draining through Seattle's ditch and culvert network while, at the same time, maintaining the conveyance function of the system. To objectives of the study included:

Devising a system of ditch categories that could be mapped in the City's GIS system;
Designing specifications for rehabilitating the ditches that produce water quality benefits *and* maintain the conveyance capabilities of various ditch categories;
Developing maintenance specifications for existing and post-rehabilitated ditches;
Prioritizing ditches for rehabilitation in terms of categories or groupings of categories;
Identifying potential environmental benefits of the Ditch and Culvert Program; and
Devising a framework for assessing the program's performance.

The classification system developed consists of six categories. Rehabilitation priorities were proposed based on these categories, where some ditches qualified in more than one category. Potential benefits of ditch rehabilitation were quantified to the extent possible, including expected pollutant concentrations in discharges from well-designed and maintained ditches. The designed framework for assessing the program's actual benefits included both field monitoring and mathematical modeling at three spatial scales.

Darla Inglis (206) 233-7160

Geomorphic Evaluation – Meadowbrook Pond

Meadowbrook Pond is an off-channel stormwater detention facility located on Thornton Creek in Northeast Seattle. The pond was completed in 1998 and has been dredged every summer since. In September 2000, dredging removed over 1375 cubic meters of material, including over 800 cubic meters of sand and gravel. SPU is evaluating the feasibility of adding sediment

to the main stem of Thornton Creek downstream from Meadowbrook Pond to replace the sediment removed by annual dredging. This study, completed by the University of Washington in May 2001, observed the geomorphic condition of the main stem of Thornton Creek downstream of Meadowbrook Pond. The study characterized the channel substrate and the composition of sediment dredged from the pond, and provided preliminary recommendations on the advisability and approach to substrate amendment.

Darla Inglis (206) 233-7160

Geomorphic Evaluation – Pipers Creek

Much of Seattle's recent investments in stream habitat enhancements have focused on creating suitable habitat for various salmonid species. However, the fully built urban areas that comprise these creek watersheds have significantly altered the mechanisms affecting how soil and gravel enter into the stream channels. As a consequence, the appropriate sizes and quantities of sediments needed to maintain desired streambed conditions might be lacking, regardless of other kinds of suitable physical habitat that may exist within the channel. This study, begun in 2001 by the University of Washington's Center for Urban Water Resources, evaluated geomorphic issues affecting sedimentation in Pipers Creek. Sediment availability and characteristics (delivery processes, relative volumes, and particle size distribution) were evaluated, and recommendations were made regarding the advisability of adding gravel to the creek bed to improve habitat conditions.

Darla Inglis (206) 233-7160

3.11.4 ESA Information

Urban Blueprint for Habitat Protection and Restoration

In June 2001, the City of Seattle completed the *Urban Blueprint for Habitat Protection and Restoration*. Drawing on recent and groundbreaking research by City scientists and independent research scientists, the Urban Blueprint analyzes chinook salmon behavior within five extant aquatic environments within the city, and as a result, also identifies important habitat attributes to protect and restore. Among the findings:

Adult Chinook. We now know that adult chinook move through the city in a matter of days. The main improvement they need is a safe way through the Ballard Locks.

Juvenile Chinook. Young chinook remain in Seattle for much longer, sometimes months, while they prepare to migrate to the ocean. While they're here, they benefit from shallow habitat with fine substrate where they can rest, feed and hide from predators. Shoreline vegetation is also important because it provides food and shade.

Based upon the blueprint's findings and continuing research,, the City of Seattle is now focusing on the following actions:

- Protecting the Puget Sound Shoreline. Protecting and restoring gravel beaches, eel grass beds and other shallow areas that provide plentiful food, refuge and spawning areas for other fish that chinook eat.
- Restoring Shallow Habitat along Lake Washington, Lake Union and the Ship Canal. Providing juvenile salmon with shallow shoreline areas, free of bulkheads and other

structures, where they can feed and escape bass and other predators.

- Improving Shallow and Side-channel Habitats in the Industrial Duwamish Waterway. Restoring tidal flats, wetlands, side channels and other areas where juveniles can feed and rest, while growing and adjusting to saltwater.
- Making Migration through the Ballard Locks Safer. Developing ways for adult and juvenile salmon to get past the Locks quickly and unharmed.

The *Urban Blueprint for Habitat Protection and Restoration* report is available at <http://www.ci.seattle.wa.us/salmon/blueprintdoc.htm>.

Martin Baker (206) 684-5984

3.12 CAPITAL IMPROVEMENT PROGRAMS

In 2001, SPU constructed several Capital Improvement Program (CIP) projects that included water quality elements. Some of the principal projects are listed below.

Neil Thibert, Drainage CIP Coordinator (206) 684-7589

3.12.1 Natural Systems

Seattle Public Utilities has developed a “Natural Systems” approach to managing stormwater in those basins whose drainage systems are based on ditches and culverts. This approach uses swales, infiltration, and landscaping techniques to reduce stormwater runoff, lower pollutant levels and, in many instances, improve general neighborhood quality.

Pipers Creek Watershed – A Natural Systems Approach

Two pilot natural systems projects were constructed in 2000/2001 in the 2.9-square mile Pipers Creek Watershed located in northwest Seattle. The first, Viewlands Swale, receives runoff from approximately 26 acres of primarily residential land use. Physical constraints at the site precluded the incorporation of an artificial flood plain or extended storage basin. Therefore, unlike traditional vegetated swales, the 270-foot Viewlands Swale has a stepped design with 15 log weirs creating a series of level pools, and the channel’s width ranges from eight to 12 feet with a channel depth of approximately 3.5 feet. The second project, known as Street Edge Alternative or SEA Street, consists of a completely redesigned residential block. The street width was decreased by roughly six feet, parking was reduced and reoriented, detention ponds and swales were constructed and planted with native vegetation, and the local soil was amended to provide for more hydraulic storage. Initial monitoring at both these project sites was conducted in 2001/2002. Preliminary results indicate that both facilities provide measurable reduction in peak flows and volumes before the runoff is discharged into Pipers Creek.

Darla Inglis (206) 233-7160

High Point Project – A Natural Systems Approach

Involving over 100 acres, the High Point redevelopment project, located in the Longfellow Creek watershed, is one of the largest development projects in recent Seattle history. To take advantage of this opportunity, SPU, Seattle Housing Authority (SHA), SDOT, and DCLU are now working together to incorporate a “natural systems” approach to meeting the flow and water quality needs of the projects. Natural systems drainage uses soil, topography, and vegetation

to achieve stormwater conveyance, flow control, and treatment in a manner that more closely approach that of natural processes rather than through traditional piped and underground infrastructure.

Miranda Maupin (206) 386-9133

3.12.2 Urban Creeks – Urban Creeks Legacy

The Urban Creeks Legacy was initiated in 1999 to provide a holistic approach to managing stormwater drainage and improving habitat in Seattle's creeks. Working side-by-side with dedicated citizens, Seattle Public Utilities (SPU) achieved significant progress toward our program goals, which include:

- Improving creek drainage and water quality systems;
- Improving natural creek habitat for fish and other wildlife;
- Enhancing creek health through stewardship and education; and
- Celebrating our creeks and the citizens who care for them.

Among the accomplishments during 2001:

Longfellow Watershed: Instream habitat improvements were substantially completed along a stretch of publicly owned land in the Delridge valley. Over 1,150 yards of creek between SW Myrtle Street and SW Juneau Street were improved. Three road culverts were replaced to improve fish passage. A portion of the Legacy Trail will run beside the project.

Thornton Creek Watershed. Designs were completed for three detention ponds to be installed at Jackson Park Golf Course to reduce downstream flooding. This project also includes stream enhancements in the course. Designs were also substantially completed for an improved fish passage through the culvert under Lake City Way at NE 100th Street. Working in partnership with Seattle Parks and Recreation, SPU purchased a 2-acre site along a tributary of Thornton Creek.

Taylor Creek Watershed. Progress was made in negotiations to acquire property necessary to construct an improved, fish friendly culvert under Rainier Avenue South.

Mapes Creek Watershed. Designs were completed to replace a failing wall near a pipe inlet south of Rainier Avenue South. SPU began investigating options for improving the connection between the creek and Lake Washington.

Chris Woelfel (206) 684-7599

3.12.3 Other Water Quality Projects

Westlake Drainage Project

In 2001, Seattle Public Utilities began construction of a project along Westlake Avenue near Lake Union to replace a failing drainage system and install several different stormwater treatment facilities. Incorporated into this project are access points for these facilities to allow for performance evaluation. These facilities will reduce pollutants entering Lake Union from

stormwater runoff.

Patrick Murphy (206) 684-5186

4. OTHER PERMIT REPORTING REQUIREMENTS

4.1 LEGAL AUTHORITY

Adequate legal authority to control discharges to and from Seattle's storm drainage systems has been established. In 2000, revisions were made to the City's Stormwater, Grading and Drainage Control Code (Seattle Municipal Code 22.800 – 22.808). In August 2001, Ecology issued revised guidance in its Stormwater Management Manual for Western Washington. In early 2002, the City began a comprehensive comparison of its current set of Stormwater requirements to Ecology's newly revised guidance.

4.2 IMPLEMENTING STORMWATER PROGRAM COMPONENTS

All program components have been implemented and are proceeding in accordance with the City's Stormwater Management Program (SWMP), as approved by Ecology on July 24, 1997.

4.3 KNOWN CHANGES IN WATER QUALITY

Based on the City's data, there were no known significant changes in the water quality of the City's receiving water bodies.

4.4 CONTROL OF INDUSTRIAL DISCHARGES INTO MS4s

Seattle's Stormwater, Grading and Drainage Control Code (SMC 22.800 – 22.808) prohibits most non-stormwater discharges from being introduced into the City's municipal storm sewer system, including harmful discharges from industrial activities. Seattle's Side Sewer Code (SMC 22.16.300) also prohibits discharging certain substances into the storm drain system. Additionally, as part of the City's Stormwater Pollution Prevention and Complaint Investigation Programs, Surface Water Quality Investigators conduct investigation when there is evidence of stormwater contamination originating from industrial discharges.

4.5 CHANGES IN PERMIT COVERAGE AREA

There were no changes in permit coverage area in 2001, and none are anticipated in 2002.

4.6 EXPENDITURES FOR STORMWATER PROGRAM

In July 1999, Seattle implemented a new financial management program called Summit. The primary driver behind the Summit Project was the year 2000 problem, which necessitated replacing the previous financial management program (Seattle Financial Management System, or SFMS). Transitioning from SFMS to Summit required developing an entirely new set of organizational, accounting, and activity cost codes. On one hand, the new coding structure has allowed for a much more detailed accounting of budgeted and actual costs incurred. However, in many cases, specific stormwater program costs remain blended with other stormwater programs costs, making an accurate categorical breakdown difficult. Additionally, some programs not included in this accounting, such as Illegal dumping and Litter Pickup, can directly and indirectly affect stormwater quality.

In keeping with the methodology used in previous reports, estimates provided in Table 10 show

the budgeted and actual overall stormwater management program budget for 2001 primarily based on SPU and SDOT expenditures. In many cases, owing to the internal organization of SPU, many general management and support functions are jointly funded by drainage, drinking water, wastewater and solid waste funds. In these cases, an assumed fraction of the total costs (typically 25% - 30%) was allocated to stormwater-related programs. It is not intended that these estimates serve as a modification of budget estimates made in previous reports. Instead, these estimates should be viewed as a refinement of the estimate provided in last year's report, but still a macro-scale analysis of stormwater program operating costs.

Table 10. Overall Stormwater Management Program Budget

Program	2001 Budgeted	2001 Actual
Drainage O&M	\$ 4,895,000	\$ 4,066,000
Street O&M *	\$ 1,774,000	\$ 1,774,000
Pollution Prevention Programs	\$ 753,000	\$ 448,000
Public Education Programs	\$ 496,000	\$ 646,000
Regulatory Development & Enforcement	\$ 678,000	\$ 517,000
Monitoring Program	\$ 458,000	\$ 200,000
Other Stormwater Program Costs	\$ 1,248,000	\$ 1,531,000
Overall Stormwater Program Budget	\$ 10,302,000	\$ 9,327,000

* 2001 Budgeted value not available

Drainage O&M: Includes SPU Field Operations Branch budgets for drainage inspection, drainage cleaning, and drainage repair, and an estimated portion of the overall branch support costs. Also included are expenses related to Conservation Corps and spot drainage program conducted by SPU.

Street O&M: Includes SDOT budgets for mechanical street sweeping, street flushing, alley flushing, and snow/ice response. Note that budgeted amounts for SDOT were not available, so actual expenditures are shown in both columns. Not included in the above table are budgets for litter pick-up (approximately \$1.5 million) and illegal dumping (approximately \$550,000).

Pollution Prevention Programs: Is based on the General Stormwater Pollution Prevention budget for SPU Community Services Division plus the natural lawns program, and green gardening program.

Public Involvement, Education & Stewardship Programs: Is based on the Water Quality Education budget for SPU Community Services Division, which includes activities that are both directly and indirectly related to stormwater education.

Regulatory Development & Enforcement: Includes estimated SPU costs for water quality complaint investigations, business inspections, and private stormwater facility inspections. It also includes drainage funds provided by SPU to SDOT and DCLU for to support development and redevelopment permit processes. Increases over 2000 estimates are primarily a result of redesignating the SPU inspection costs under enforcement category rather than Pollution Prevention.

Monitoring Program: Includes an expenditures for monitoring conducted by SPU Community Services Division, urban creeks programs, and costs associated with grant-funded monitoring projects.

Other Stormwater Program Costs: Includes estimated proportions of general program

management and other support costs.

Robert Chandler (206) 684-7597

4.7 REVISIONS TO FISCAL ANALYSIS

In accordance with Section S9 of the permit, a permit modification is required if there is a greater than 20-percent difference between the *projected* annual budget values contained in the City's SWMP (Table 9.7 in the 1997 SWMP) and the actual budget *adopted* by the City Council. The projected annual budget contained in Seattle's 1997 SWMP ended with fiscal year of 2000.

5. NEXT STEPS

Seattle's differs from that of many other jurisdictions in that there is a very low rate of redevelopment within our jurisdiction's boundary—on the order of a few percent per year—and only a fraction of these projects are large enough to trigger regulations requiring stormwater treatment and/or flow control facilities be installed. This means that progress toward improving the quality of stormwater runoff can be best made through:

- A suite of stormwater programs aimed at reducing pollution at or near their sources;
- An on-going maintenance and operations program designed to keep our infrastructure operating properly; and
- A municipal capital improvement program based on placing the appropriate technologies at targeted locations.

Looking ahead, we will work to better understand how best to focus the above fundamentals of stormwater management. In some areas of the City, for example where the drainage system is primarily ditches and culverts, there may be an emphasis placed on targeted retrofits. It is in these areas that a *natural systems approach* can bring a high return on investments. In other areas of the City, where more formalized curb and gutter drain systems are present, for example, a set of programs focusing on infrastructure maintenance and pollution prevention actions may prove to be a cost-effective approach for improving water quality. Over time we will continue to adjust and enhance our efforts as our knowledge increases and the state-of-the-practice improves.

The City of Seattle has been involved in managing stormwater runoff since the late 1800s, when the first drainage systems were constructed in response to typhoid and diphtheria epidemics. We remain committed to meeting the challenges of managing stormwater in our urban environment today and into the future.

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APPENDICES

APPENDIX A - STORMWATER MANAGEMENT PROGRAM MANAGERS

Stormwater Management Program	Program Manager
Aquatic Community Assessment Program	Laura Reed (206) 615-0551
Basin & Creek GIS Delineation	Scott Reese (206) 733-9172
Bitter Lake & Haller Lake Stormwater Quality Studies	Beth Schmoyer (206) 386-1199
BMP Effectiveness Monitoring	Beth Schmoyer (206) 386-1199
BMP Evaluation for Informal Drainage Areas	Darla Inglis (206) 233-7160
Business and Industry Recycling Venture	Hans VanDusen (206) 684-4657
Business Inspection Program	Ellen Stewart (206) 615-0023
Capital Improvement Programs	Neil Thibert, Drainage CIP Coordinator (206) 684-7589
Central Area Community Festival	Michael Davis (206) 615-1376
CIP Performance Evaluation	Laura Reed (206) 615-0551
Citizen Advisory Committee	Carlton Stinson (206) 684-7624
Comprehensive Creek Inventory	Joe Starstead (206) 684-7877
Comprehensive Drainage Plan Update	Darla Inglis (206) 233-7160
Creek Steward Program	Bob Spencer (206) 684-4163
Densmore Drainage Basin	Sahba Mohandessi (206) 684-7592
Hydrologic Monitoring of Natural Systems	Darla Inglis (206) 233-7160
Ditch and Culvert Inventory	Darla Inglis (206) 233-7160
Ditch/Culvert Identification, Prioritization & Maintenance Guidelines	Darla Inglis (206) 233-7160
Drainage and Wastewater Line of Business	Denise Andrews (206) 684-4601
Drainage Maintenance Crew Training – Standard Operating Procedures	Shanti Colwell (206) 386-1501
Drainage Plans and Permit Approval	Kaveh Aminian (206) 233-7858
Environmental Education Team	Anthony Matlock (206) 386-9746
Environmental Grant Funding	Anthony Matlock (206) 386-9746
ESA Regional Roads Maintenance Program	Sandy Gurkewitz (206) 684-8574
ESA Team	Martin Baker (206) 684-5984
Taylor Creek Environmental Watershed Internship	Kathy Minsch (206) 615-1441
Geomorphic Evaluation – Meadowbrook Pond	Darla Inglis (206) 233-7160
Geomorphic Evaluation – Pipers Creek	Darla Inglis (206) 233-7160
GIS Support	Harvey Arnone (206) 233-0028
Green Cleaning Kits	Michael Davis (206) 615-1376
Green Gardening Program	Carl Woestwin (206) 684-4684
Hazardous Material Inventory	John Labadie (206) 684-8311
Hazardous Material Reduction	Shab Zand (206) 233-5172
High Point Project – A Natural Systems Approach	Miranda Maupin (206) 386-9133
Household Hazardous Waste Program	Kathy Minsch (206) 615-1441
Illegal Dumping	Alex Tonel (206) 684-4170
In Concert with the Environment (ICE)	Mike Mercer (206) 684-0570
Interagency Regulatory Analysis Committee	Ryeann-Marie Woods (206) 386-4024
Lake Union Action Team	Robert Chandler (206) 684-7597
Local Hazardous Waste Management Program	Kathy Minsch (206) 615-1441
Longfellow Creek Watershed Project	Sheryl Shapiro (206) 233-2046
Lower Duwamish River Sediment Cleanup and Restoration	Martha Burke (206) 684-7686

Appendix A - Stormwater Management Program Managers (continued)

Stormwater Management Program	Program Manager
Memoranda of Agreement	Terry Kakida (206) 615-0507
Natural Lawn and Garden Care Campaign/Natural Soil Building	Carl Woestwin (206) 684-4684
Norfolk Drainage Basin	Richard Smith (206) 684-5012
NPDES Municipal Stormwater Permittee Interagency Working Group	Robert Chandler (206) 684-7597
Operations & Maintenance of Drainage System	Pat Gorham (206) 386-9730
Operations and Maintenance of Roadways	Jim Dare (206) 684-5319
Pesticide Free Parks	Tracy Dieckhoner (206) 386-4595
Pesticide Reduction	Tracy Dieckhoner (206) 386-4595
Pipers Creek Watershed – A Natural Systems Approach	Darla Inglis (206) 233-7160
Pipers Creek Watershed Project	Beth Miller (206) 684-0877
Precipitation Monitoring	Hirad Mousavi (206) 615-0826
Private Stormwater Detention System Inspections	Paul Kramer (206) 733-9162
Salmon in the Schools	Carlton Stinson (206) 684-7624
South Park Drainage Basin	Sahba Mohandessi (206) 684-7592
SPU Spill Coordinator/Response Program	John Labadie (206) 684-8311
Storm Drain Stenciling/Oil Spill Program	Carlton Stinson (206) 684-7624
Storm Event Sampling	Mike Hinson (206) 733 9134
Stormwater Structural BMP Mapping	Darla Inglis (206) 233-7160
Stormwater, Grading and Drainage Control Code	Robert Chandler 206-684-7597
Surface Water Quality Database	Mike Hinson (206) 733 9134
Taylor Creek and Deadhorse Canyon	Tom Gannon (206) 684-8565
Taylor Creek Environmental Watershed Internship	Kathy Minsch (206) 615-1441
Thornton Creek – Basinwide Flow Control Plan	Neil Thibert (206) 684-7589
University of Washington Center for Urban Watershed Management	Robert Chandler (206) 684-7597
Urban Blueprint for Habitat Protection and Restoration	Martin Baker (206) 684-5984
Urban Creeks – Urban Creeks Legacy	Chris Woelfel (206) 684-7599
Urban Creeks Watershed Analysis	Katherine Lynch 206-233-5194
Urban Creeks and Watershed Stewardship	Kathy Minsch (206) 615-1441
Water Quality Complaints	Ellen Stewart (206) 615-0023
Westlake Drainage Project	Patrick Murphy (206) 684-
Watershed Forums	Keith Kurko, WRIA 8 (206) 233-1516; Judith Noble, WRIA 9 (206) 684-8078.
Watershed Resource Inventory Area (WRIA) Coordination	Keith Kurko, WRIA 8 (206) 233-1516; Judith Noble, WRIA 9 (206) 684-8078

APPENDIX B – PERMIT REPORTING REQUIREMENTS CROSS-REFERENCE

The table below cross-references the reporting requirements contained in the 1995 NPDES Municipal Stormwater Permit with the appropriate sections contained in this report.

Permit Reporting Requirement	Req't No.	Cross-referenced Section in this Report
Status of implementing the components of the stormwater management program.	S10.B.1	3.1 - Comprehensive Stormwater Planning (p. 7) 3.3 - Regulations & Technical Standards (p. 13) 3.6 - Illicit Discharges (p. 23) 3.8 - Operations & Maintenance of Drainage System (p. 30) 3.9 - Operations and Maintenance of Roadways (p. 31) 3.10 - Municipal Training (p. 32) 3.11 - Information & Data Collection, Management & Analysis (p. 33) 3.12 - Capital Improvement Programs (p. 41) 4.1 - Legal Authority (p. 43)
Changes in permit coverage area:	S10.B.2	4.5 - Changes in Permit Coverage Area (p. 43)
Expenditures for stormwater program	S10.B.3	4.6 - Expenditures for Stormwater Program (p.43)
Revisions to fiscal analysis	S10.B.4	4.7 - Revisions to Fiscal Analysis (p. 45)
Summary and analysis of cumulative monitoring data (4th Year Report only)	S10.B.5	Not applicable
Summary of compliance activities, inspections, and education activities	S10.B.6	3.4 - Permitting, Inspections & Enforcement - (p. 14) 3.5 - Stormwater Pollution Prevention (p. 18) 3.7 - Public Involvement, Education, Stewardship (p. 24)
Known changes in water quality	S10.B.7	4.3 - Known Changes in Water Quality (p. 43)
Status of watershed-wide coordination activities	S10.B.8	3.2 - Partnerships (p. 10)